



*The World Leader in Vibrating Wire Technology*

48 Spencer Street  
Lebanon, NH 03766, USA  
Tel: 603•448•1562  
Fax: 603•448•3216  
E-mail: [geokon@geokon.com](mailto:geokon@geokon.com)  
<http://www.geokon.com>

# **Model GK-405**

## **Vibrating Wire Readout**

### *User's Manual*

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## Table of Contents:

<b>1. Introduction .....</b>	<b>1</b>
1.1 Features .....	2
1.2 GK-405 Vibrating Wire Readout Application.....	3
1.3 Before using the GK-405 Vibrating Wire Readout .....	4
<b>2. Installation and Operation.....</b>	<b>5</b>
2.1 Initial Quick Start Sequence.....	5
2.2 Establishing contact with the Remote Module .....	7
2.3 Installing the GK-405 VWRA .....	9
2.3.1 Launching the GK-405 Installer.....	10
2.4 Starting the Vibrating Wire Readout the first time .....	15
<b>3. User Interface.....</b>	<b>18</b>
3.1 Overview .....	18
3.2 Live Readings Screen (Generic Mode).....	18
3.2.1 Display Mode.....	18
3.2.2 Sensor Index.....	20
3.3 Sensor Selection Screen .....	22
3.3.1 Project Explorer.....	23
3.4 Application Menu .....	27
3.4.1 Live Readings.....	28
3.4.2 Edit Settings.....	33
3.4.3 Remote Connect with... ..	33
3.4.4 Terminal Window.....	35
3.5 File Menu.....	36
3.5.1 Delete Data Files.....	36

3.5.2 Export Menu .....	37
3.5.3 Import Menu .....	41
3.5.4 View Data.....	43
3.5.5 Close GK-405 .....	44
<b>4. Configuring Project Explorer Elements .....</b>	<b>45</b>
4.1 Project Configuration .....	45
4.2 Sensor Configuration .....	46
<b>5. Files, Folders and Transferring Data .....</b>	<b>52</b>
5.1 File Transfer .....	52
5.2 Backing up configurations .....	53
<b>APPENDIX A. GK-405 Connections .....</b>	<b>54</b>
A.1. Single Sensor Connection.....	54
A.2. Load Cell Connection .....	55
A.3. Charger Connections .....	56
<b>APPENDIX B. Remote Module Command Structure.....</b>	<b>57</b>
<b>APPENDIX C. Data File Formats.....</b>	<b>59</b>
C.1 Raw Data Text Report.....	59
C.2 Data Text Report with Column and Report Headers .....	60
<b>APPENDIX D. Specifications .....</b>	<b>61</b>
D.1 GK-405 (Remote Module) Specifications .....	61
D.2 Hand-Held Device (HHD-NX7-B) Specifications .....	62

## **Table of Figures:**

Figure 1 - GK-405 with handheld PC in cradle .....	1
Figure 2- Vibrating Wire Gage and Load Cell Connectors.....	2
Figure 3 - Hand-held PC running GK-405 VWRA.....	3
Figure 4- ActiveSync Window showing active connection .....	9
Figure 5 - Windows Mobile Device Center .....	10
Figure 6 - Windows Explorer window displaying HHD root folder .....	11
Figure 7 - Hand-held device root folder contents.....	11
Figure 8 - Installation CD or Folder Contents.....	12
Figure 9 - GK-405 Installer at root of HDD .....	13
Figure 10 - GK-405 Install Screen .....	13
Figure 11 - GK-405 VWRA Icon in Start->Program.....	14
Figure 12- Select Workspace Name .....	15
Figure 13 - Workspace Folder Selection .....	16
Figure 14 - Workspace Exist.....	16
Figure 15 - Remote module not found    Figure 16 - Default initial screen.....	17
Figure 17 - Live Readings - Generic Mode .....	18
Figure 18 - Display Mode drop-down menu .....	19
Figure 19 - Sensor Index drop-down control .....	20
Figure 20 - Menu Options .....	21
Figure 21 - View Options.....	21
Figure 22 - Sensor Selection Screen.....	22
Figure 23 - Project Explorer with expanded projects .....	23
Figure 24 - Context Menu .....	24
Figure 25 - Workspace Selection Window    Figure 26 - List of Workspace Names .....	25

Figure 27 - Sort Elements Sub-Items .....	26
Figure 28 - Application Menu .....	27
Figure 29 - Sensor Selection Screen, Remote Module Connected .....	28
Figure 30 - Live Readings Menu Selections .....	29
Figure 31 - Live Readings Screen (Sensor Selected) .....	29
Figure 32 - Menu Options.....	30
<i>Figure 33- Auto Store Settings</i> .....	31
Figure 34 - Clear Data Warning .....	31
Figure 35 - View Options .....	32
Figure 36 - Displayed Sensor Reads.....	33
<i>Figure 37 - Remote Connect with...</i> .....	34
Figure 38 - Terminal Window .....	35
Figure 39 - File Menu Options .....	36
Figure 40 - Delete Data Files Window .....	37
Figure 41 - Export Menu.....	38
Figure 42 - Export Data Window    Figure 43 - Save File Window.....	39
Figure 44 - Extended Format Window.....	39
Figure 45 - Export Path Selection Window    Figure 46 - No Project Selected Error.....	41
Figure 47 - Select Project Export File.....	42
Figure 48 – Data File Selection Window.....	43
Figure 49 - Sensor Reads Window .....	43
<i>Figure 50 - Project Settings</i> .....	45
Figure 51 - Sensor Settings Window (page 1).....	46
<i>Figure 52 – Sensor Settings (page 2)</i> .....	47
Figure 53 - Sensor Settings (page 3) .....	49
Figure 54 - Sensor Settings (page 4) .....	50



Figure 55 - Single Sensor Connector .....	54
Figure 56 - Load Cell Connector .....	55
Figure 57 - Charger Connection .....	56
Figure 58 - Enhanced Data Text Report .....	60



# 1. Introduction

---

The GK-405 Vibrating Wire Readout is made up of two components:

- the Readout Unit, consisting of a Windows Mobile handheld PC running the GK-405 Vibrating Wire Readout Application (see Figure 3)
- the GK-405 Remote Module which is housed in a weather-proof enclosure and connects to the vibrating wire gage to be measured.



*Figure 1 - GK-405 with handheld PC in cradle*

The two components communicate wirelessly using Bluetooth<sup>®</sup>, a reliable digital communications protocol. The Readout Unit can operate from the cradle of the Remote Module (see Figure 1) or, if more convenient, can be removed and operated up to 20 meters from the Remote Module (see Note 1).

**Note 1:** In most cases 20 meters will be the maximum but differences in battery, atmospheric and geographic conditions may reduce the actual effective range.

## 1.1 Features

Rugged, general purpose, reliable readout based on a Windows Mobile handheld PC:

- all the benefits of a Windows compatible device (Windows file system, RS-232, USB and wireless connectivity)
- long battery life
- ease of use

Lightweight and simple Remote Module:

- lithium battery (8+ hours of continuous use)
- one button operation; automatic power down when Bluetooth connection is dropped or after several minutes of inactivity
- reliable connection to standard vibrating wire gages and load cells is accomplished via two 10-pin Bendix connectors (see Figure 2)
- housed in a durable aluminum enclosure



*Figure 2- Vibrating Wire Gage and Load Cell Connectors*

## 1.2 GK-405 Vibrating Wire Readout Application

The GK-405 Vibrating Wire Readout Application (GK-405 VWRA) installs and runs on a ruggedized hand-held PC (see Figure 3) and is designed to communicate via Bluetooth with Remote Modules connected to vibrating wire gages.



Figure 3 - Hand-held PC running GK-405 VWRA

### 1.3 Before using the GK-405 Vibrating Wire Readout

The readout software runs as an application under Windows Mobile 5 or 6 operating system installed on a hand-held PC.

- Please familiarize yourself with the hand-held PC and the Windows Mobile OS.
- It is assumed in the instructions below that you can launch applications from the Start button including File Explorer and the Bluetooth Settings manager.
- It is assumed that you can tap the keyboard icon as needed and use the on-screen keyboard to enter text and numbers.

## 2. Installation and Operation

---

The steps described in section 2.1 are an attempt to guide the user through the process of launching the GK-405 VWRA, connecting to the sensor and taking a reading. If all parts of the GK-405 are purchased as a system, Geokon makes every effort to ensure that the system is completely set up and working before it leaves the factory. Other times, the user may already own the hand-held PC and are setting up their hardware and software for the very first time. The steps below attempt to cover all cases and refer the user to the appropriate section when more information is needed.

For those users that have purchased a complete GK-405 system, a workspace with the name of "GK405" will have been pre-defined and the hand-held unit will already be paired with the Remote Module. Note that the workspace name can be changed at any time or new ones can be created (see section 3.2.1). When purchasing a GK-405 system, sections 2.2 through 2.4 can possibly be skipped but a quick review is recommended.

### 2.1 Initial Quick Start Sequence

The following steps are a guide to the typical operation of the GK-405 and, if followed, should result in a successful sensor measurement:

- A) If the Remote Module has been previously paired with the hand-held unit, then press the button labeled "POWER ON (BLUETOOTH)". A blue light will be on and blinking, signifying that the Remote Module is waiting to connect to the hand-held unit.

If the Remote Module was purchased separately from the hand-held unit, see section 2.2 (Establishing Contact with the Remote Module). Launch the GK-405 VWRA by tapping on "Start" from the hand-held PC's main window, then tap "Programs" then tap the GK-405 VWRA icon. If the GK-405 Vibrating Wire Readout Application has not been installed, please see section 2.3 (Installing the GK-405 VWRA).



- B) After a few seconds, the blue light on the Remote Module should change to a steady state blue (lit but not flashing) and the Live Readings Window will be displayed (see section 3.2, "Live Readings Screen (Generic Mode)" - Figure 17).

If the window shown in Figure 12 is displayed instead of the Live Readings Window, please refer to section 2.4, "Starting the Vibrating Wire Readout the first time".

If the Live Readings Window is displayed but no Thermistor or Vibrating Wire output is shown, please refer to section Appendix A, "GK-405 Connections".

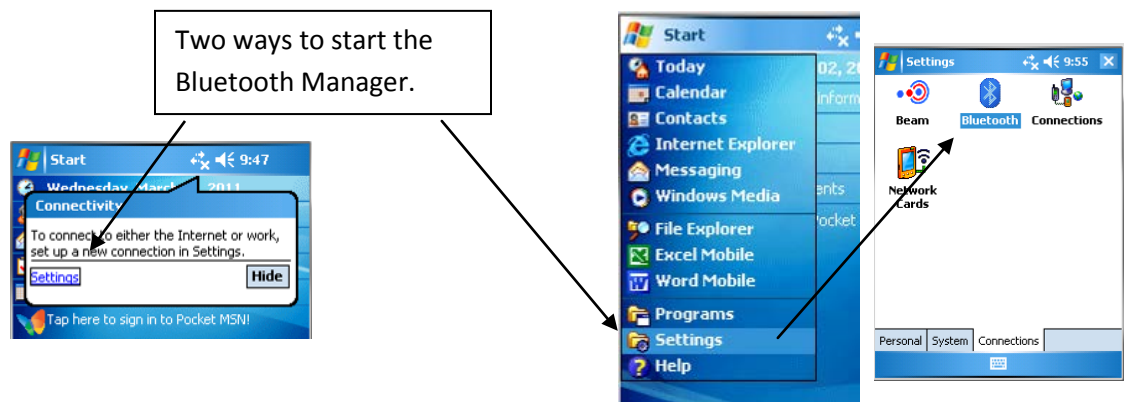
- C) From the Live Readings Window (see Figure 17), different display modes may be selected as appropriate for the sensor (see section 3.2.1, "Display Mode"). If a sensor is connected that contains more than one vibrating wire "cell", the "Sensor Index" may be changed to view the vibrating wire output for each "cell", or the average may be displayed.
- D) If displaying sensor output in engineering units is desired, tap on "View" then "Sensor Selection Screen" to select a pre-defined sensor or to create a new sensor configuration. Please refer to section 3.3, "Sensor Selection Screen" as well as, section 4.2, "Sensor Configuration".
- E) To close the GK-405 VWRA from the Live Readings Screen, tap "Menu" then "Close GK-405".



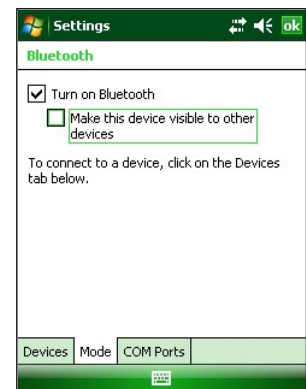
## 2.2 Establishing contact with the Remote Module

In general this should only need to be done once and is typically done before it leaves the factory. Follow the steps below to ensure the 'partnership' with the remote is established before using the readout software:

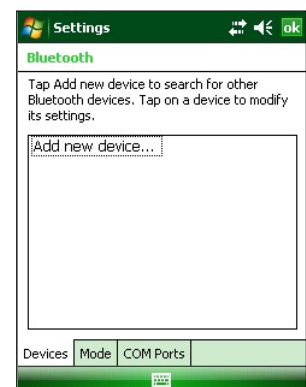
1. Use the Bluetooth Settings Manager on the hand-held PC to set up the link to the remote. Read about setting up a Bluetooth "partnership" in Chapter 9 of the hand-held PC's Reference Guide.



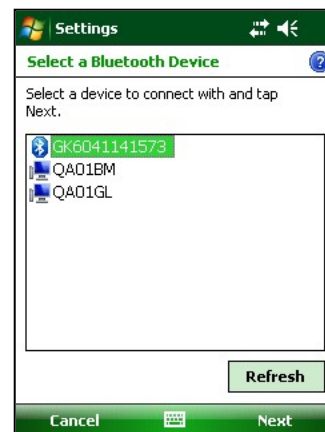
2. Once in the Bluetooth Settings Manager, click on the "Mode" tab and then make sure that the box next to "Turn on Bluetooth" is checked.



3. Click on the "Devices" tab. If it shows a "Geokon" device (name will start with "GK" and contain the remote's serial number), go to step 6. Otherwise turn on the remote module (should see a flashing blue indicator on the remote) and select "Add new device...".



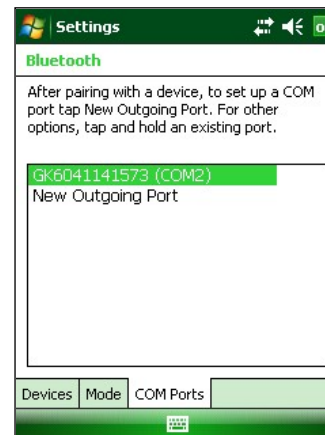
4. When a suitable remote is discovered, highlight the device and click Next.



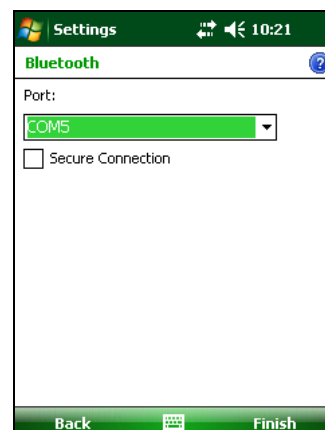
5. A prompt will be displayed for a password; enter "default" and press Next again. If a partnership with the device is successfully established the screen will momentarily display the prompt to the right and then return to the Bluetooth Devices screen.



6. Click on the COM Ports tab. If the "Geokon" device is already assigned to a COM Port, the partnership process is finished. If not, tap on "New Outgoing Port".



7. Select an available COM port (COM5 is the default). Be sure to remember the number of the COM port as you may have to select it later in the readout software (see section 3.4.3). Make sure to "uncheck" the "Secure Connection" check-box. Tap finish when done.



## 2.3 Installing the GK-405 VWRA

The installation of the GK-405 VWRA requires the following:

- Hand-held device (HHD) running Windows Mobile Classic 5.X (6.X recommended) or higher with at least 50 Mbytes of free memory. HHD must be Bluetooth enabled and be able to assign a Bluetooth connection to a COM port. Windows .NET 3.5 Compact Framework (CF) and .NET framework English-language Messages package installed on HHD. Both "CAB" file installers are included in the GK-405 VWRA installer "Zip" file, available on Geokon's web-site or via an installer CD.
- Microsoft ActiveSync version 4.5.0 or higher running on the host PC (see Figure 4) or Windows Mobile Device Center if PC is running Windows 7 (see Figure 5) as well as the HHD. An active connection between the two must be established either via a physical link or Bluetooth.

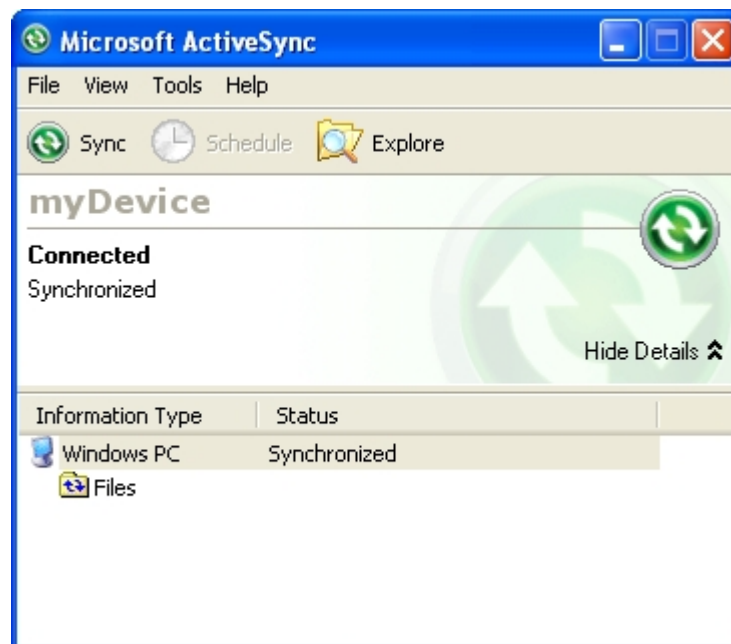


Figure 4- ActiveSync Window showing active connection



*Figure 5 - Windows Mobile Device Center*

### **2.3.1 Launching the GK-405 Installer**

From the Windows Mobile Device Center window on the PC (see Figure 5) click on the folder icon labeled "Browse the contents of your device" to call up an Explorer Window for the HHD (see Figure 6). The procedure for ActiveSync is very similar.

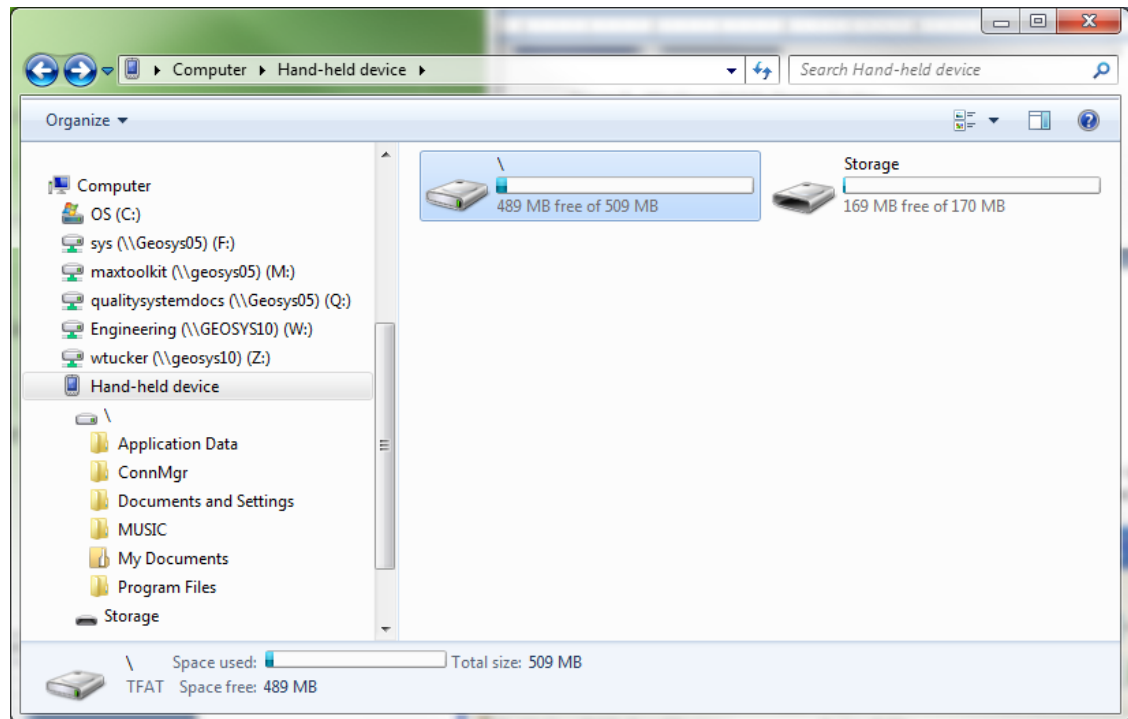


Figure 6 - Windows Explorer window displaying HHD root folder

In the Figure 6 above, double-click the icon labeled “\” to navigate to the hand-held PC’s system root shown in Figure 7.

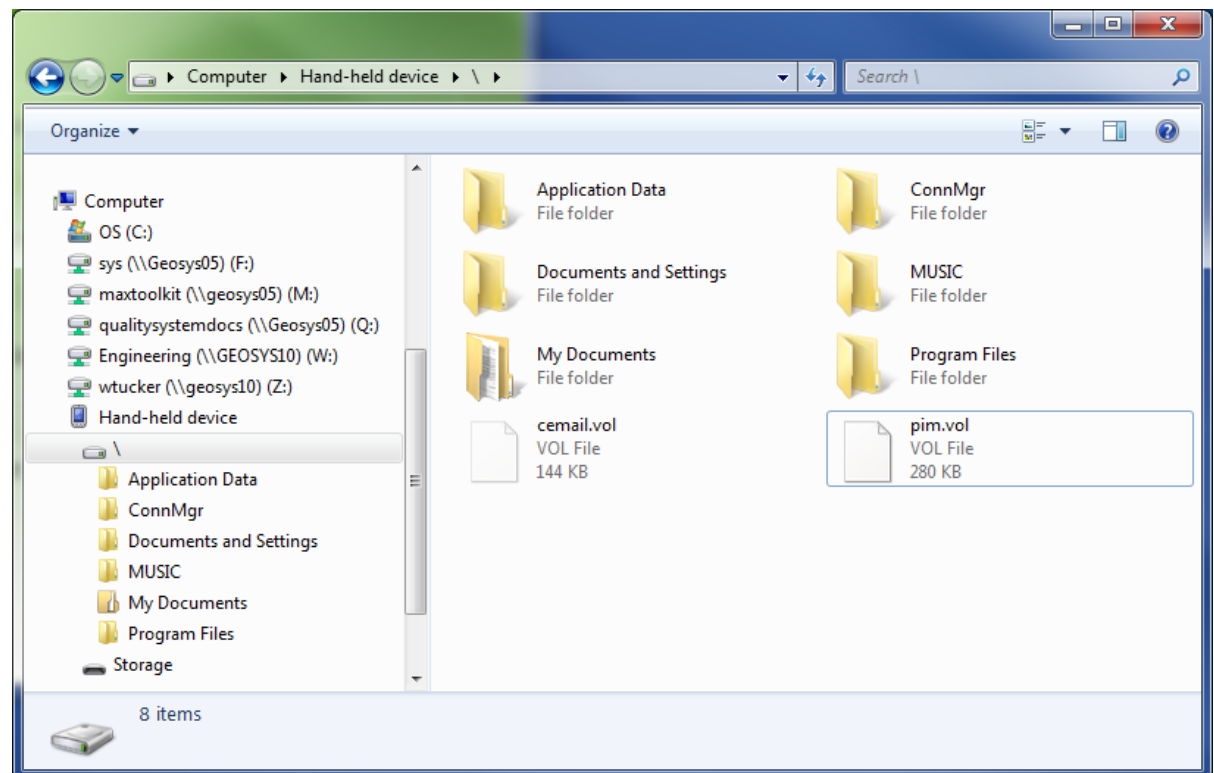
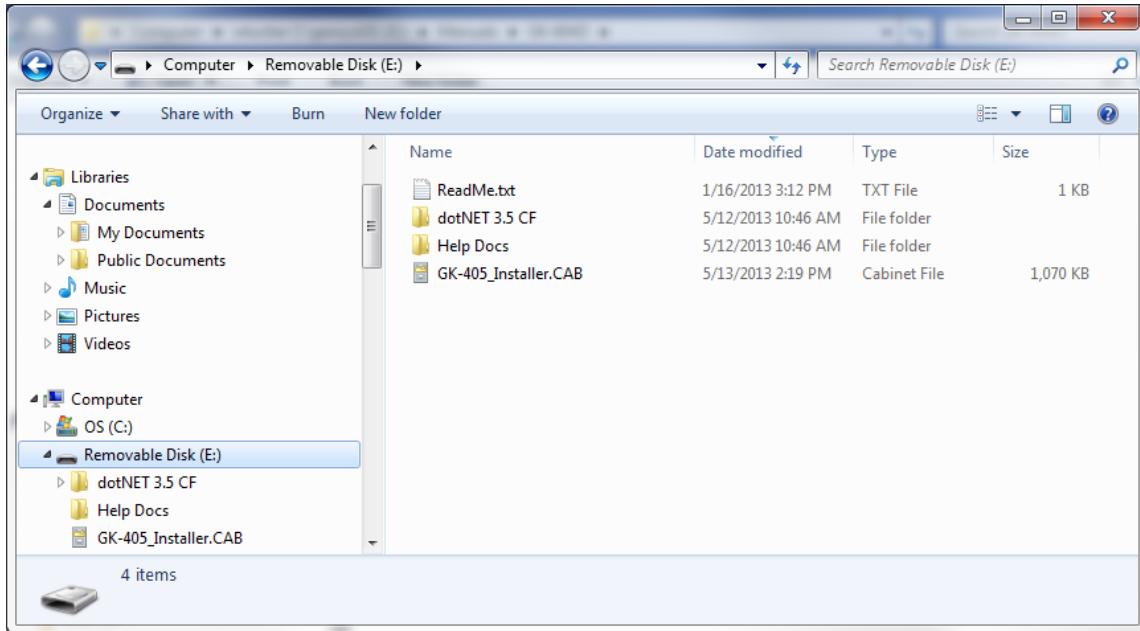


Figure 7 - Hand-held device root folder contents

Next, insert the GK-405 Installation CD into the PC's CD/DVD drive (or unzip the installer if downloaded from Geokon's web-site), open a Windows Explorer window and then navigate to the root folder of the Installation CD or folder (see Figure 8).



*Figure 8 - Installation CD or Folder Contents*

Copy the file, "GK405\_Installer.CAB" from the Installer CD to the HDD system root folder. From the HDD, navigate to the system root folder using File Explorer (see Figure 9) and tap the file, "GK405\_Installer" to execute the installer.

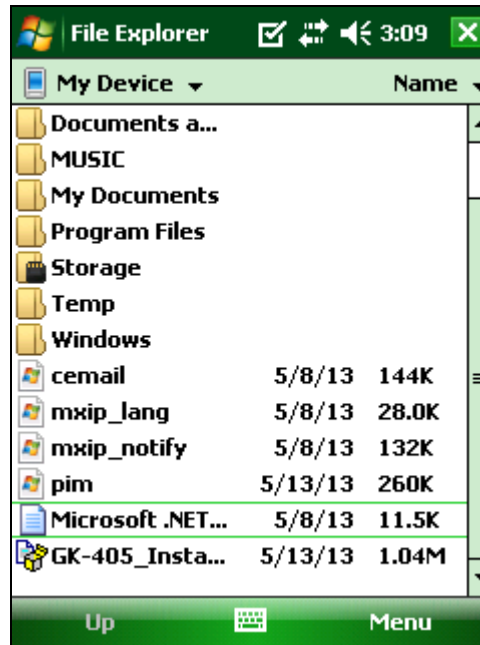


Figure 9 - GK-405 Installer at root of HDD

If there is a storage card installed in the HDD then the user will be prompted to choose the location for the installation (see Figure 10). It is recommended that “Device” be selected then tap “Install” with the stylus to initiate the install process.

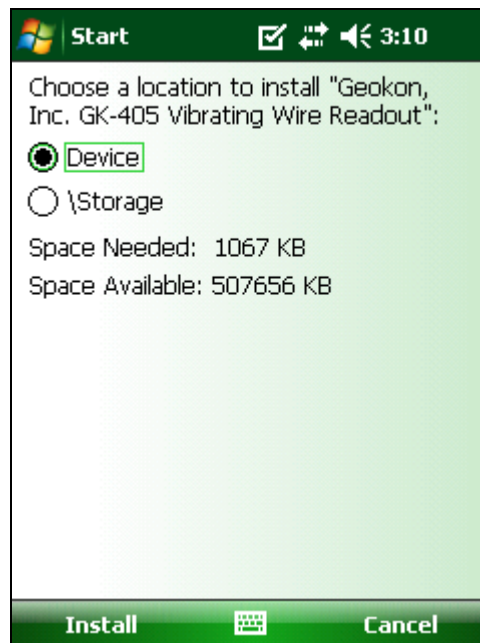


Figure 10 - GK-405 Install Screen

The file, GK405\_Installer.CAB can be now deleted from the system root folder to free up memory. The GK-405 VW Readout application is now installed and its icon should appear in "Start->Programs" (see Figure 11).

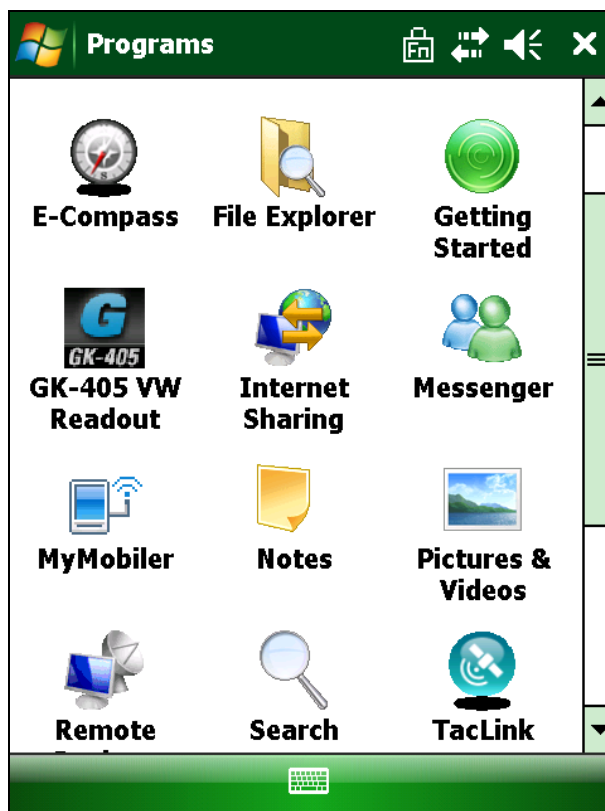


Figure 11 - GK-405 VWRA Icon in Start->Programs

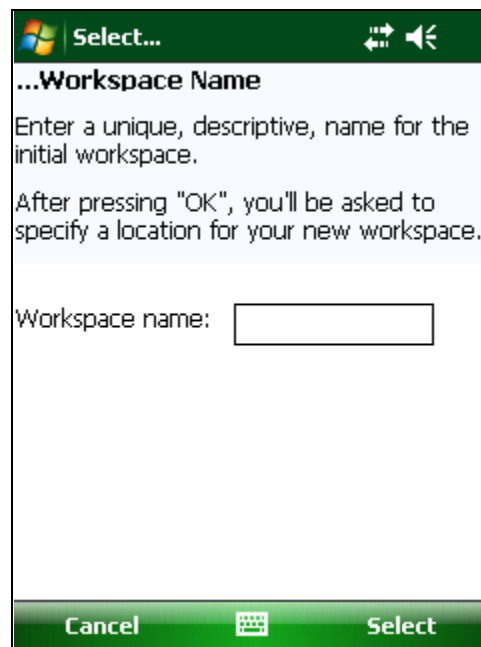


## 2.4 Starting the Vibrating Wire Readout the first time

The readout software is launched by tapping the Start button and selecting the icon (to the right) from the drop down list or clicking on Programs and then clicking the icon (to the right).



When starting the GK-405 Vibrating Wire Readout Application (GK-405 VWRA) for the first time, you will be prompted to create a workspace name. The workspace name can be any combination of letters and numbers and should be descriptive in nature. After creation, this name will be displayed in the Project Explorer window.



*Figure 12- Select Workspace Name*

Once you've selected the name for your workspace, you will be prompted to choose or create a folder on your hand-held device where all the workspace elements will be stored. As can be seen below, the default workspace location is in a folder name the same as the workspace name under a special shared folder reserved for workspaces. For Windows Mobile devices this folder is located at:

\Application Data\Geokon\GK-405\Workspaces.

GK-405 VWRA appends the name of the new workspace to this shared folder (see Section 5) and uses it as the default location for the new workspace. The user is free to select their own location, either by entering it directly, or the **Browse [ ... ]** button may be used to navigate to a different folder location or to create a new folder (see below). This workspace location will be stored in the GK-405 VWRA configuration for subsequent application access. After workspaces are created, all future user access to workspaces is always by name.

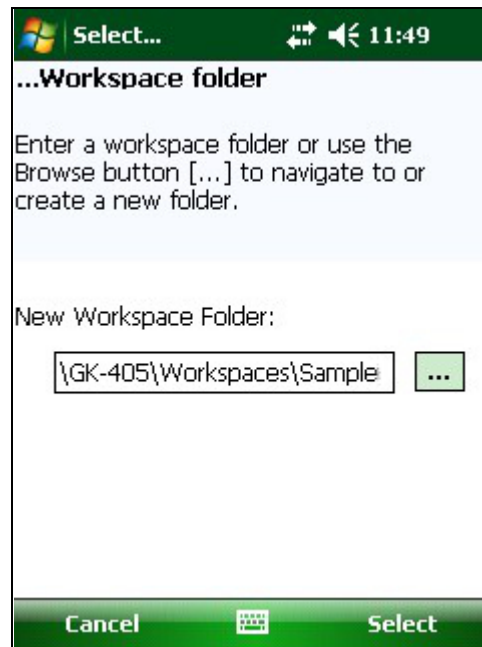


Figure 13 - Workspace Folder Selection

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**Note:** If the newly selected workspace folder contains an existing workspace, GK-405 VWRA will display a dialog asking the user if they want to import the workspace as is or to rename it with the previously specified new workspace

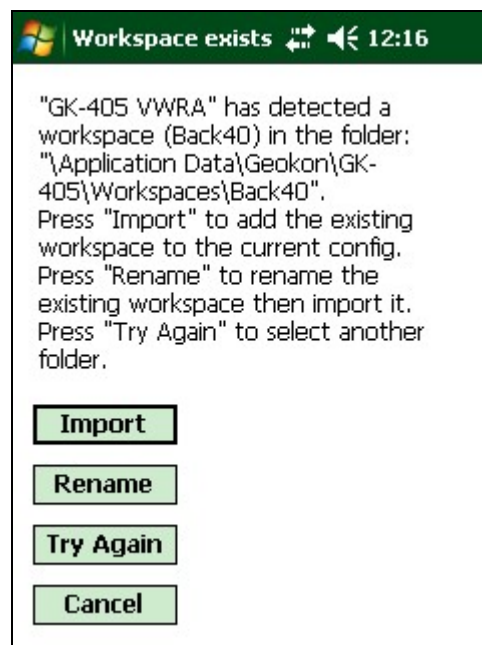


Figure 14 - Workspace Exist

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After the initial workspace is created the GK-405 VWRA will attempt to connect to a remote module. If no remote module can be found then the error message seen in

Figure 15 will be displayed. By default the GK-405 VWRA looks for a remote module connection on COM5 but will remember the COM number of the last successful connection. Please see section 2.2 for more information regarding establishing a connection with the remote module.

If the connection attempt is unsuccessful, the newly created workspace will be opened by default and you will be able to create new project(s) and add new sensor configurations to your workspace (See Figure 16).

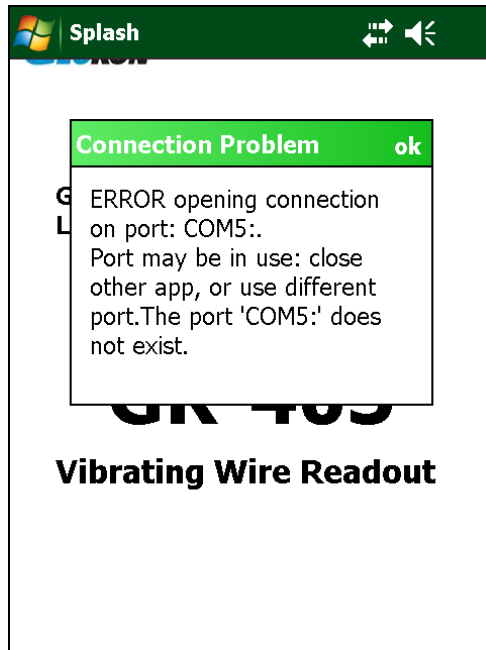


Figure 15 - Remote module not found

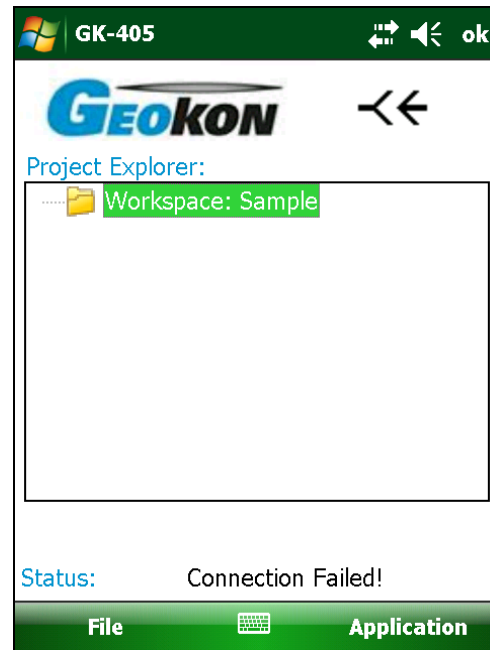



Figure 16 - Default initial screen

---

 **Note:** With all subsequent attempts to connect to the Remote Module, please ensure that the “Power On” button on the Remote Module has been pressed (blue light will be blinking) before launching the GK-405 VWRA.

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## 3. User Interface

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### 3.1 Overview

Following a successful Bluetooth connection, the GK-405 VWRA will boot up displaying the screen shown in Figure 17. This is the Live Readings screen and it is shown in “Generic Mode”, meaning that there is no sensor selected. The following sections describe the GK-405 VWRA user interface in greater detail.

### 3.2 Live Readings Screen (Generic Mode)

Figure 17 shows a typical vibrating-wire piezometer output in digits and thermistor output in degrees Celsius.

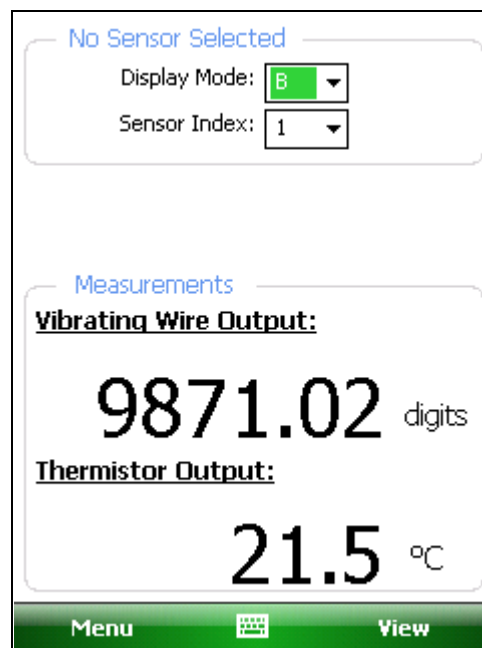


Figure 17 - Live Readings - Generic Mode

In “Generic Mode”, the two on-screen controls that control gage measurement are “Display Mode” and “Sensor Index”.

#### 3.2.1 Display Mode

Display Mode selects pre-programmed parameters which are optimized for different gages. Each option has different scaling and processing characteristics. Figure 18 depicts the options available from the Display Mode drop-down menu.

See Table 1 to determine the best choice for the sensor to be measured.

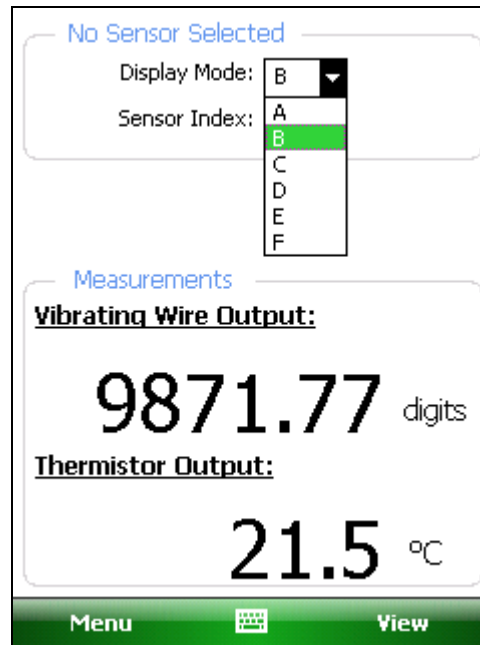


Figure 18 - Display Mode drop-down menu

Display Mode	Geokon Model Nos.	Calculation	Units	Sweep Freq.(hz)
A	all	Period, T	microseconds	450-6000
B	4300BX,4400, 4500,4600, 4700,4800,4900	$F^2 \times 10^{-3} \text{ }^{(1)}$	digits	1400-3500
C	4000	$F^2 \times 10^{-3} \times 4.062$	microstrain	450-1200
D	4200	$F^2 \times 10^{-3} \times 3.304$	microstrain	450-1200
E	4100	$F^2 \times 10^{-3} \times 0.39102$	microstrain	1400-3500
F	4300EX	$F^2 \times 10^{-3}$	digits	2500-6000

Table 1 - Display Mode options (A-F)

Note 1:  $F = 1 / T$

### 3.2.2 Sensor Index

Some Geokon instruments are comprised of more than one sensor. For instance, a Geokon load cell may contain 3, 4 or 6 individual vibrating wire sensors per load cell. The Sensor Index control allows reading the individual sensors in an instrument as well as an average of all sensors (see Figure 19).

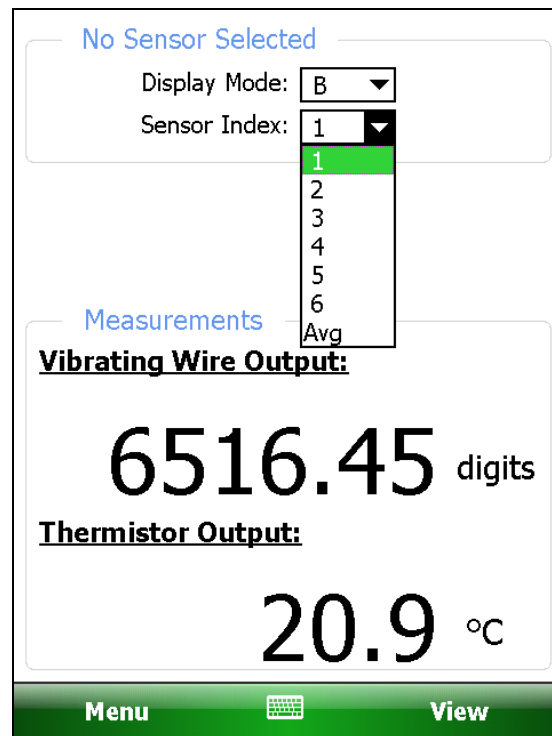


Figure 19 - Sensor Index drop-down control

In addition to the controls described in sections 3.2.1 and 3.2.2, Menu Options (see Figure 20) and View Options (see Figure 21) allow functionality such as storing, saving and viewing data. In "Generic Mode", the only Menu Option enabled is "Close GK-405" and the only View Option enabled is "Sensor Selection Screen", described further in the next section (see section 3.3).

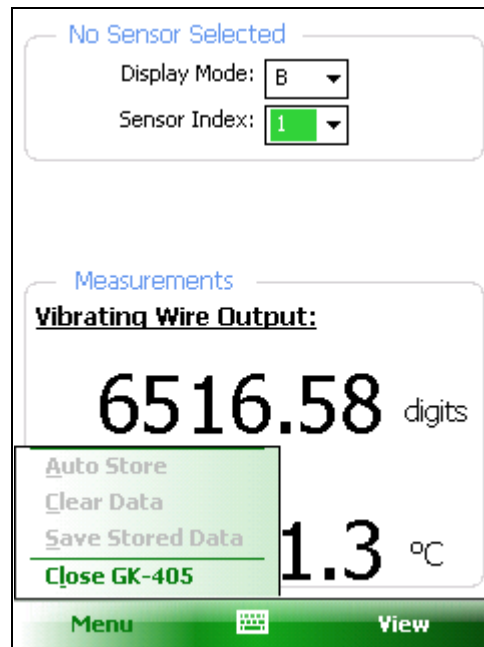


Figure 20 - Menu Options

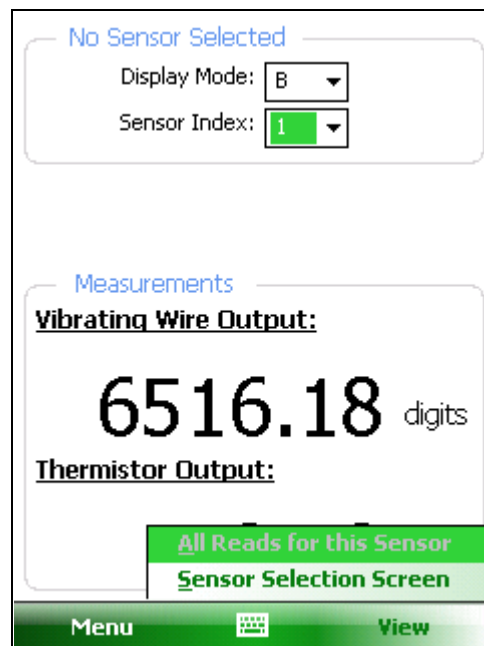


Figure 21 - View Options


### 3.3 Sensor Selection Screen

The GK-405 VWRA Sensor Selection Screen (see Figure 22) contains a number of navigation controls designed to make job of selecting application elements and functions easier. These navigation controls present an organizational view of the active workspace, inform the user about the state of the application, and provide the user with tools to configure and control Geokon devices.



Figure 22 - Sensor Selection Screen

---

 **Note:** While the operator is using the functions and features of the Sensor Selection Screen, the Remote Module may timeout and drop the Bluetooth connection after about 6 minutes to conserve battery power. This is normal and the connection can easily be restored using “Remote Connect with...” Application menu option (see section 3.4.3 for more information).

---

The Sensor Selection Screen is comprised of several core components:

Project Explorer	Element selection tool. Context (drop-down) menu.
Application Menu	Allows display changes, workspace, project and sensor configuration as well as connection to the remote module.
File Menu	File and project explorer element exporting and importing. Data file viewing and deleting options.



Status Area Displays the connection status of the application.

### 3.3.1 Project Explorer

The Project Explorer is the primary navigation mechanism for moving around the GK-405 VWRA workspace. The Project Explorer presents a view of the workspace which includes projects and sensors. These views reflect the hierarchical relationship between these elements.

The highest element in the workspace hierarchy tree is a project. Projects allow a GK-405 VWRA user to group sensors into organizational units based on the user's preference. A project can reflect a specific site where sensors have been installed such as a construction project. This organizational feature makes it easy to find sensor configurations along with related data files. The list of sensors defined under the project can be viewed by selecting a specific project and expanding its branch in the explorer view (click on + sign preceding project name) (see Figure 23).

In the hierarchy of the project explorer, sensors are child elements of a project. Sensor settings can be edited by selecting the desired sensor in the explorer tree. Once selected, sensor settings can be displayed using "Edit Settings" from the context menu (Figure 24) or by using the Application Menu (Figure 27).



Figure 23 - Project Explorer with expanded projects

### 3.3.1.1 Context Menu

From the Project Explorer, new workspace elements can be added by using the context menu. Access the drop-down menu by tapping and holding the explorer element that is to be operated on. A menu is then displayed that is context sensitive in that, based on the current selection, the appropriate elements will be enabled and others will be disabled. The screen-shot below shows the drop-down menu with the menu item, "Add Sensor", enabled (not grayed out) since a "project" element is selected in the Project Explorer (Figure 24). Additional information for each context menu item follows:

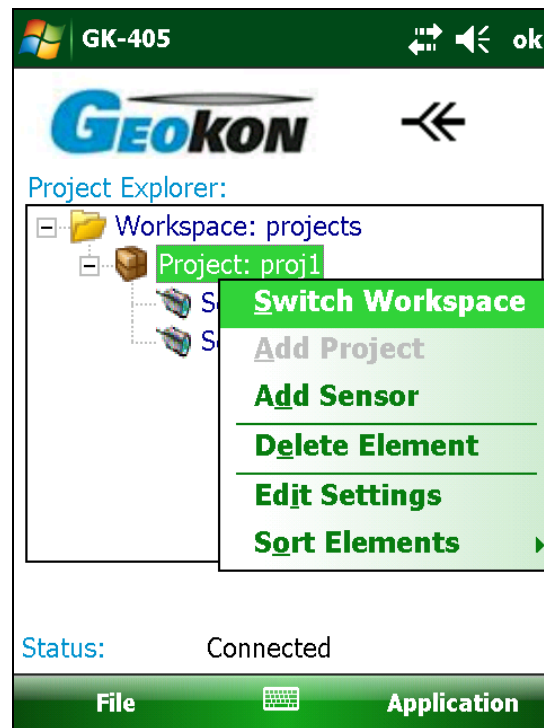


Figure 24 - Context Menu

#### Switch Workspace:

Use this context menu item to open any previously opened workspace, select a workspace from the file system or create a completely new workspace. Click this menu item to display the Workspace Selection window (see Figure 25).

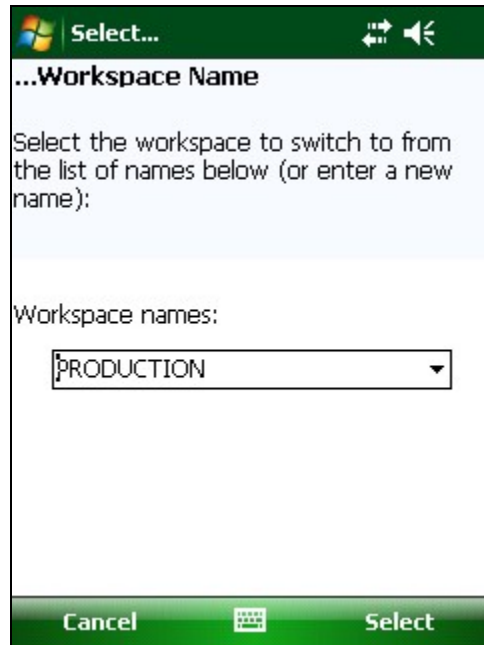
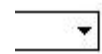


Figure 25 - Workspace Selection Window



Figure 26 - List of Workspace Names

Click on the drop-down control to display the available workspaces (see Figure 26)



Alternatively, a new name can be entered in the workspace name selection box. If the GK-405 VWRA recognizes the name as a workspace it has opened before, it will simply re-open the existing workspace.

If the workspace name is new to the GK-405 VWRA then a workspace folder selection window is displayed (see Figure 13). Select the appropriate folder (or use the default) and a new workspace is created with the name entered above.

### Add Project:

This menu item allows new projects to be created and added to a workspace. After tapping on this Context Menu item, the Project Settings Dialog will be displayed and can be edited. See section 4.1 for more information regarding project configuration. This menu item will only be enabled when the workspace is selected.

### Add Sensor:

This menu item allows new sensor configurations to be created and

added to a project. After tapping on this Context Menu item, the Sensor Settings Dialog will be displayed and can be edited. See section 4.2 for more information regarding sensor configuration. This menu item will only be enabled when a project is selected.

### Delete Element:

Project Explorer Elements can be deleted using this Context Menu item. A confirmation dialog will be displayed before the element is deleted.

### Edit Settings:

This menu item allows configuration editing of the selected Project Explorer Element. See Section 3.4.2 for more information regarding configuration editing.

### Sort Elements:

Project and Sensor explorer elements can be sorted by newest or oldest first by selecting the appropriate "Sort Elements" sub-item (see Figure 27).

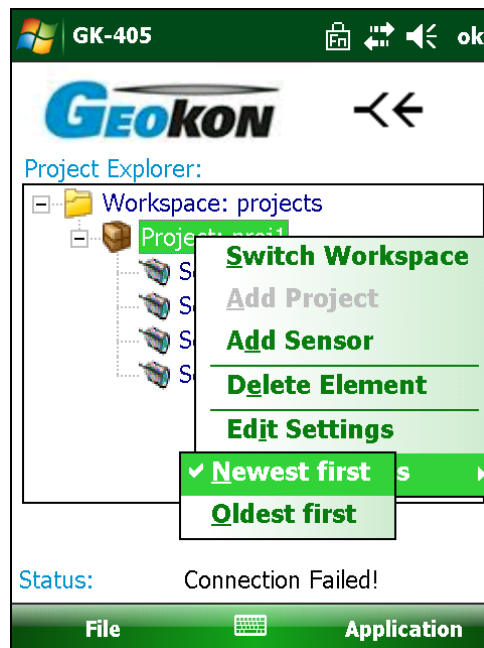


Figure 27 - Sort Elements Sub-Items

### 3.4 Application Menu

The GK-405 VWRA Application Menu provides access to the high level application functionality. It is located in the lower, right corner of the main window frame (see Figure 28). Some items of this menu can also be accessed via the context menu.



Figure 28 - Application Menu

### 3.4.1 Live Readings

This menu item will only be enabled if a successful connection has been established with the remote module. A successful connection is indicated by the icon to the right of the “Geokon” label as well as, a status of “Connected” at the bottom of the main screen. Both of the connection indicators are shown inside red ovals in Figure 29 (see section 2.2 and 3.4.3 for information regarding connecting to the remote module).



Figure 29 - Sensor Selection Screen, Remote Module Connected

Tapping on the “Live Readings” menu item displays the sub-menu shown in Figure 30).

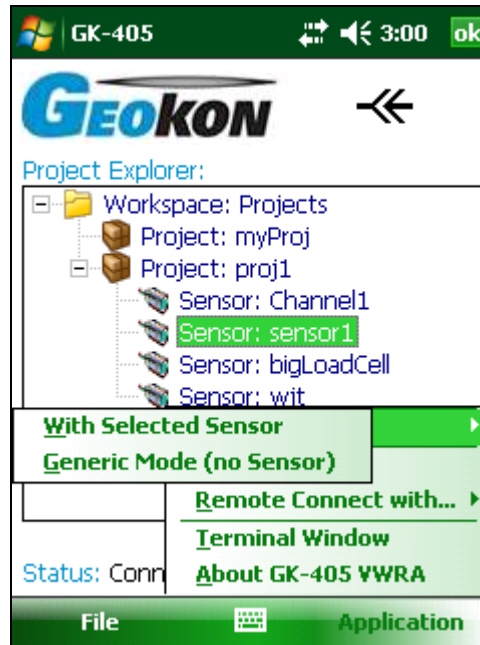


Figure 30 - Live Readings Menu Selections

#### 3.4.1.1 Live Readings With Selected Sensor

Tapping this menu item will cause the Live Readings screen to be displayed with its parameters initialized for the specific sensor selected (see Figure 31). Please refer to Appendix A for information regarding sensor connections.

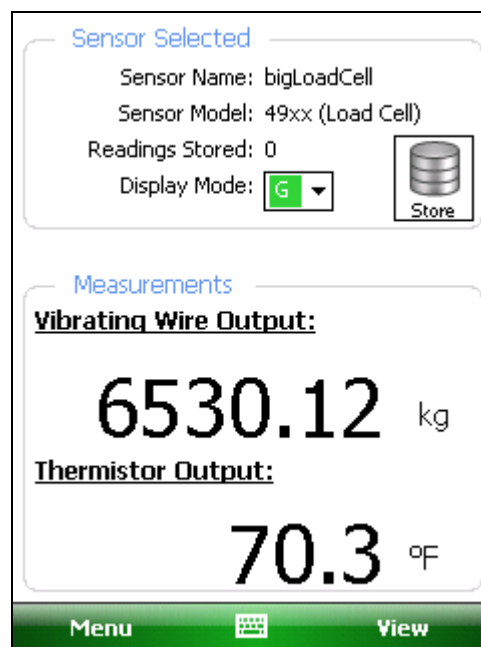


Figure 31 - Live Readings Screen (Sensor Selected)

Much like “Live Readings in Generic Mode”, Display Mode contains selections “A – F”, corresponding to different sensor “pluck” frequencies (see Table 1). The “Live Readings With Selected Sensor” window also contains a “G” selection for Display mode (the default when entering this window) which cause the raw sensor output to be converted to engineering units (see section 4.2, “Sensor Configuration”, for more information on engineering units).

Note that when a sensor is selected, Live Readings contains a “Store” button that allows multiple readings to be stored for a particular sensor. With each tap on this button a new reading is stored for the selected sensor. Each time a reading is stored, a “beep” will be heard from the hand-held unit.

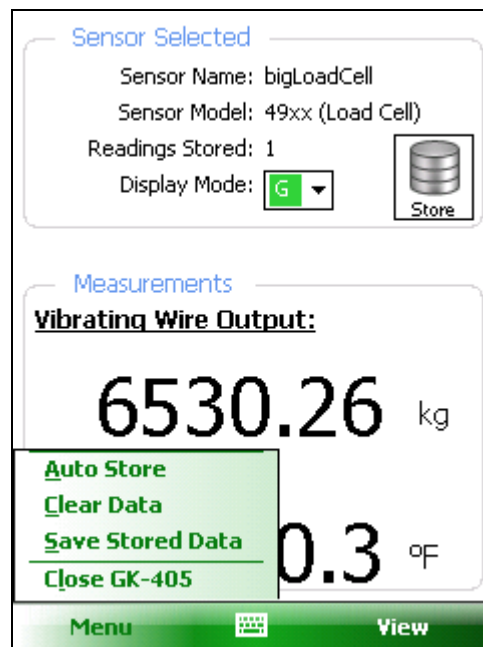


Figure 32 - Menu Options

#### 3.4.1.1.1 Menu Options

The available Menu options (see figure 32) are outlined below:

**Auto Store** – Allows multiple readings to be taken over time. Select “Auto Store: Enable” (see Figure 33) as well as an interval in seconds to enable readings to be stored periodically without intervention from the user. At any time this feature can be turned off by selecting “Auto Store: Disable” and tapping “Save”.



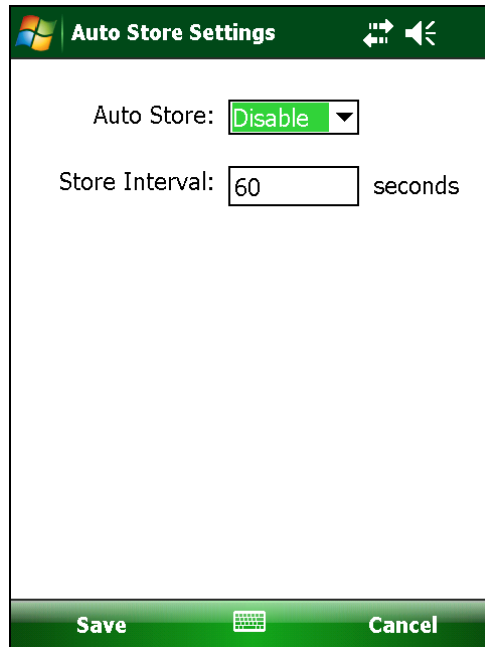


Figure 33- Auto Store Settings

**Clear Data** – Allows clearing of all readings stored (in the current session) for the selected sensor. Tapping this menu option displays the warning below (see Figure 34). Tapping “Yes” will clear all data (from the current session) and will reset the “Readings Stored:” counter to “0”. This feature has no effect on previously saved data.

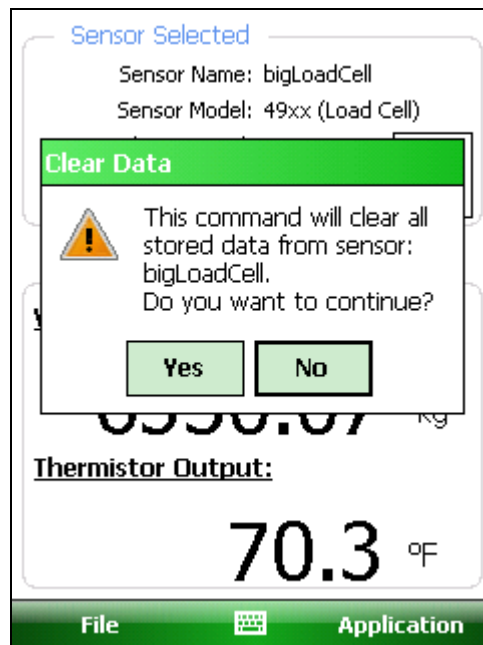


Figure 34 - Clear Data Warning

**Save Stored Data** – Saves all stored data (from the current session) for the selected sensor. A message is displayed informing the user how many readings were stored. The “Readings Stored:” counter will also be reset to “0”. The readings are saved to a file contained in a special data folder under the sensor configuration folder structure.

**Close GK-405** – Shuts down the application and breaks the connection to the Remote Module. The user will be given the opportunity to save any stored data (from the current session).

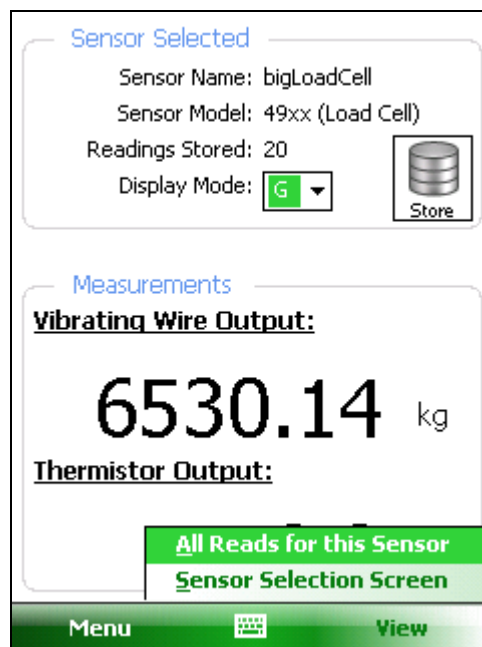
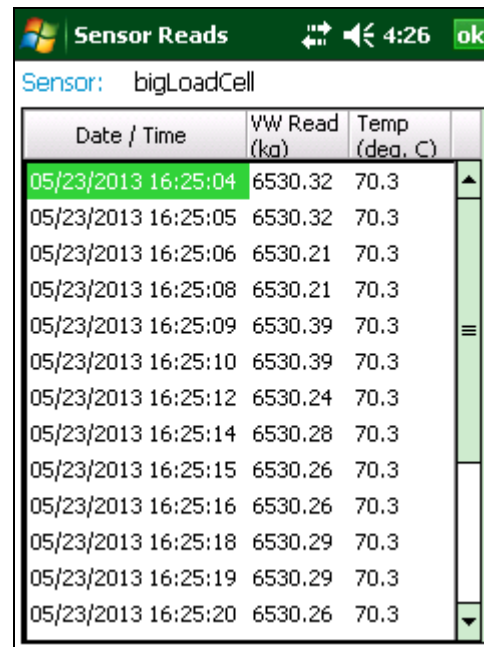


Figure 35 - View Options

#### 3.4.1.1.2 View Options

The available View options (see Figure 35) are outlined below:

**All Reads for this Sensor** – This feature displays a window showing all stored reads for the selected sensor in the current session (see Figure 36). The display is an abbreviated version of one used in section 3.5.3, “View Data”, with just the date and time, sensor read (in engineering units) and temperature.



The screenshot shows a mobile application window titled "Sensor Reads". At the top, there is a status bar with a Windows logo, the title "Sensor Reads", a signal strength indicator, a battery icon, and the time "4:26". Below the status bar, the text "Sensor: bigLoadCell" is displayed. The main content is a table with three columns: "Date / Time", "VW Read (kg)", and "Temp (deg. C)". The table contains 13 rows of data, with the first row highlighted in green. A vertical scrollbar is visible on the right side of the table.

Date / Time	VW Read (kg)	Temp (deg. C)
05/23/2013 16:25:04	6530.32	70.3
05/23/2013 16:25:05	6530.32	70.3
05/23/2013 16:25:06	6530.21	70.3
05/23/2013 16:25:08	6530.21	70.3
05/23/2013 16:25:09	6530.39	70.3
05/23/2013 16:25:10	6530.39	70.3
05/23/2013 16:25:12	6530.24	70.3
05/23/2013 16:25:14	6530.28	70.3
05/23/2013 16:25:15	6530.26	70.3
05/23/2013 16:25:16	6530.26	70.3
05/23/2013 16:25:18	6530.29	70.3
05/23/2013 16:25:19	6530.29	70.3
05/23/2013 16:25:20	6530.26	70.3

Figure 36 - Displayed Sensor Reads

**Sensor Selection Screen** – This option returns operation to the “Sensor Selection Screen” where other sensors may be selected, edited or created. See section 3.3 for more information.

#### 3.4.1.2 Live Readings Generic Mode (No Sensor)

See section 3.2 of this manual.

### 3.4.2 Edit Settings

As with the Context Menu (see section 3.2.1), tapping the “Edit Settings” menu will invoke the Settings Editor for the currently selected Project Explorer element (See the section 4, “Configurations” for more information on settings).

### 3.4.3 Remote Connect with...

If the application displays the status, “Connection Failed” as shown in Figures 15 and 16 at any time, the following options should be considered:

- Make sure the remote is turned on (blue light blinking).
- Select the “Application” menu option “Remote Connect with” (see Figure 28) and pick the COM port previously established in section 2.2 (see Figure 36).

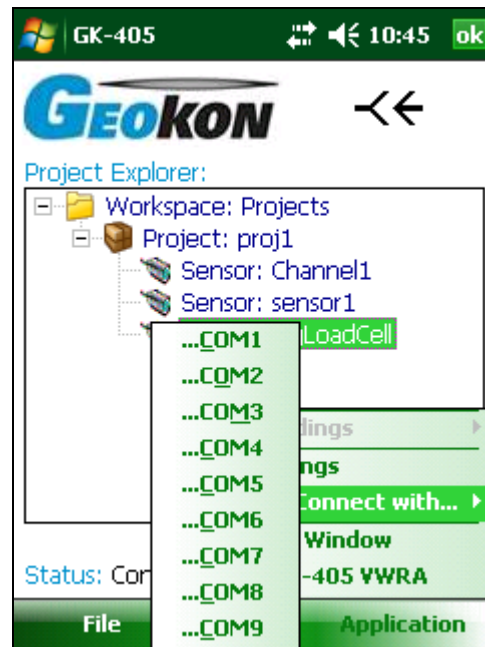


Figure 37 - Remote Connect with...

A successful connection is reflected in the Main Screen status as in Figure 29.

### 3.4.4 Terminal Window

This feature requires an active Bluetooth connection to the Remote Module. If enabled, tapping this menu option calls up the screen shown in Figure 38. Using the "Terminal Window" requires the use of the on-screen keyboard to enter simple one or two character commands to the Remote Module. See Appendix B for more information regarding the Remote Module command structure.

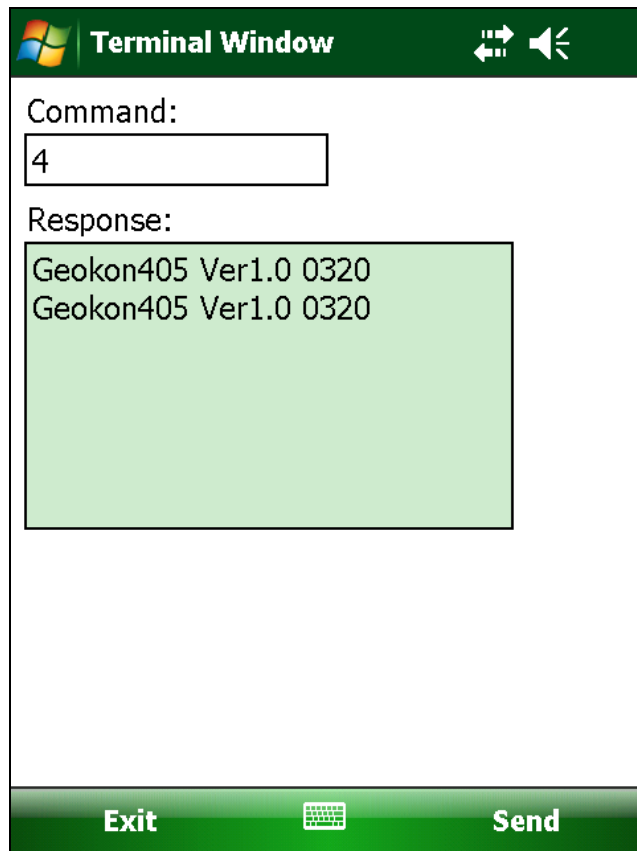


Figure 38 - Terminal Window

After typing a command in the "Command:" text box, tap the "Send" menu to issue the command to the Remote Module. Repeated taps of "Send" will re-issue the same command. Typing a command in the "Command:" text box, followed by a keyboard "Enter" will cause the Remote Module to execute the command one time only.

### 3.5 File Menu

The file menu is used to import and export Project Explorer element settings along with data export, viewing and report generation. It also is used to delete previously saved sensor data files (see Figure 39).

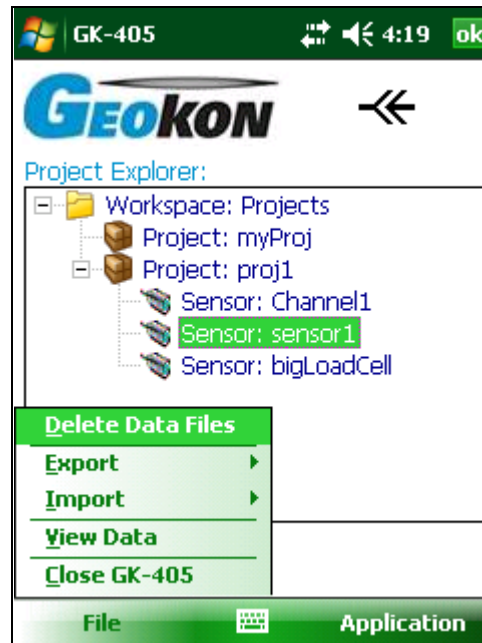


Figure 39 - File Menu Options

#### 3.5.1 Delete Data Files

If a sensor is selected and contains data files then tapping on the “Delete Data Files” File Menu option displays the window shown in Figure 40.

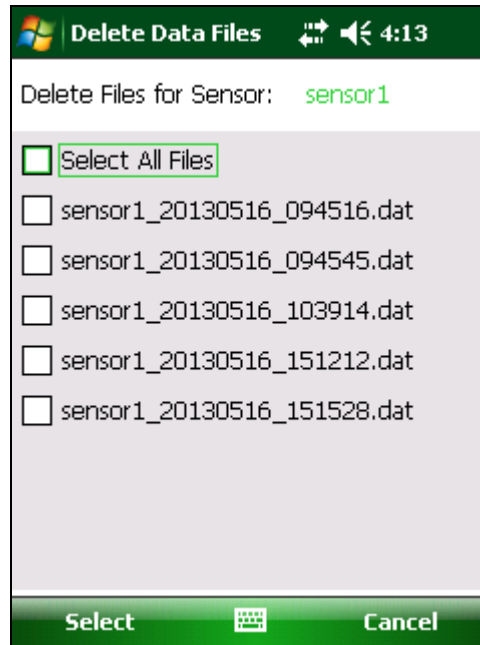


Figure 40 - Delete Data Files Window

Select one or more individual files or use the “Select All Files” checkbox to select all files. Tapping on “Select” will cause the GK-405 VWRA to prompt the user to confirm that they really want to delete the selected files. Tap on “Yes” to finish the deletion.

### 3.5.2 Export Menu

The Export menu is used to export sensor data and project element settings to a folder of the user’s choosing (see Figure 41).

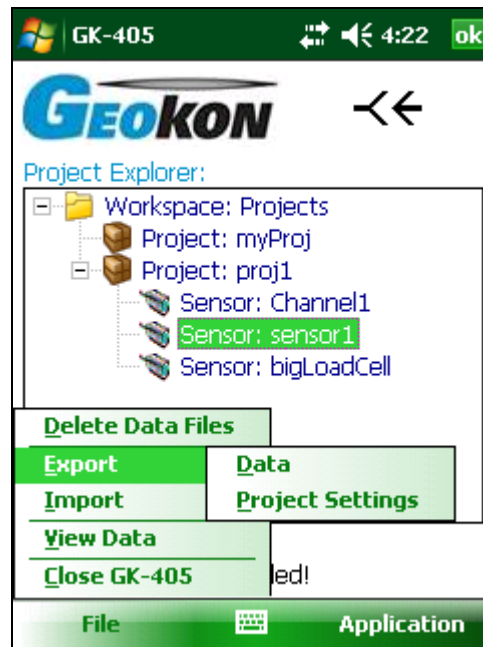


Figure 41 - Export Menu

### 3.5.2.1 Export Data Menu Option

The Export Data Menu Option allows exporting of data from the current sensor - selected via the Project Explorer. Figure 42 shows the files available for sensor, "bigLoadCell". A file may be selected (or deselected) by tapping in the "Select" column. Multiple files may be selected for exporting. If a selected file name is too long to fit in the "File Name:" text box, tap inside the text box and use the arrow keys on the hand-held's external keypad to scroll left or right. Once all the desired files are selected, tap "Export" to display the Save File window (Figure 43) where a new name and folder may be specified for each file.



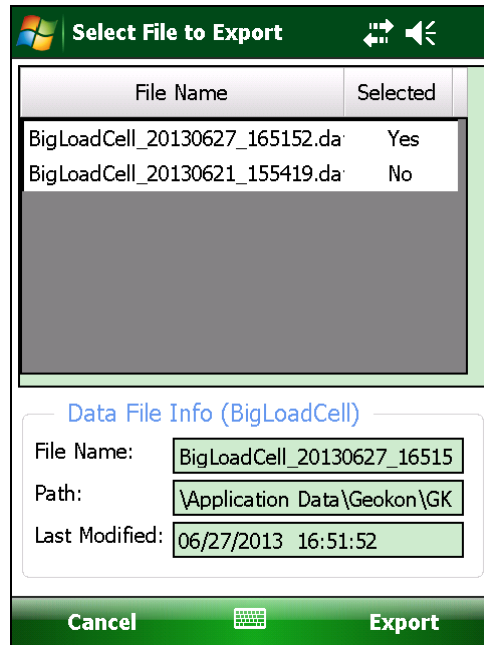


Figure 42 - Export Data Window

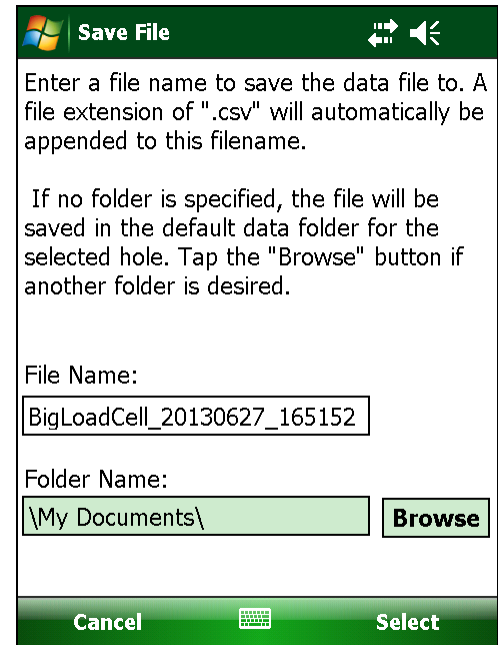


Figure 43 - Save File Window

After all the paths for each file have been specified, the Extended Format window will be displayed (see Figure 44).

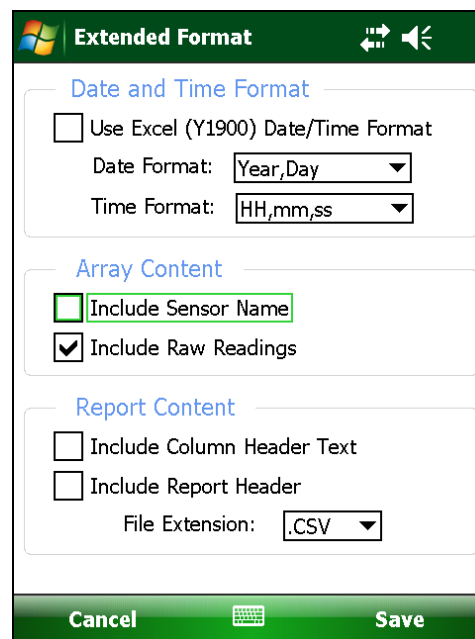


Figure 44 - Extended Format Window

The Extended Format Window allows additional formatting options to be

applied to the data before exporting. These options are described below:

#### **Date and Time Format:**

If the "Use Excel (Y1900) Date/Time Format" checkbox is checked, the Date and Time format drop-down controls below it will be disabled. The date and time is saved in a numeric format that can be readily formatted in MS Excel and is equal to the number of seconds since 1/1/1900 (the fractional part amounts to the elapsed time, the day the measurement took place).

If the "Use Excel (Y1900) Date/Time Format" checkbox is **not** checked, the Date and Time formats can be individually set via their respective drop-down controls.

#### **Array Content:**

The array content can be changed to include or exclude the sensor name as well as the raw readings (the default selection) (before conversion by the gage factor) of the sensor. Some Geokon sensors may contain up to 6 individual vibrating wire gages so checking "Include Raw Readings" will add 7 (6 cells + the average) additional columns to the export data.

#### **Report Content**

The data "report" can be changed to include or exclude column header text as well as report header text. Please refer to Appendix C for an example of column header and report header text.

The file extension for the generated file can also be changed from ".csv" to ".txt". If ".txt" is selected as the data file extension, then all the column data will be separated by tabs instead of commas.

#### 3.5.2.2 Export Project Settings

Clicking on this menu item displays the "Select Export Path" window (see Figure 45), from which a path to export the project settings file can be chosen. All sensor configurations and their respective data files within the project are compressed into a single export file. The naming format for the project export file is:

`<Selected Path> + <Project Name> + ".lvpe"`

If no project is selected in the Project Explorer an error message will be

displayed (see Figure 46).

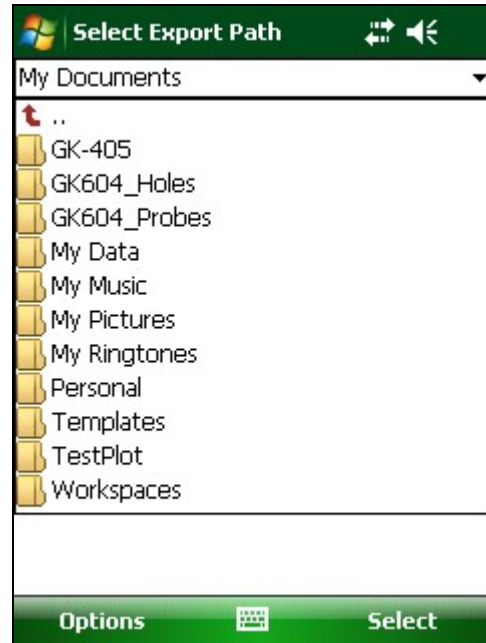


Figure 45 - Export Path Selection Window

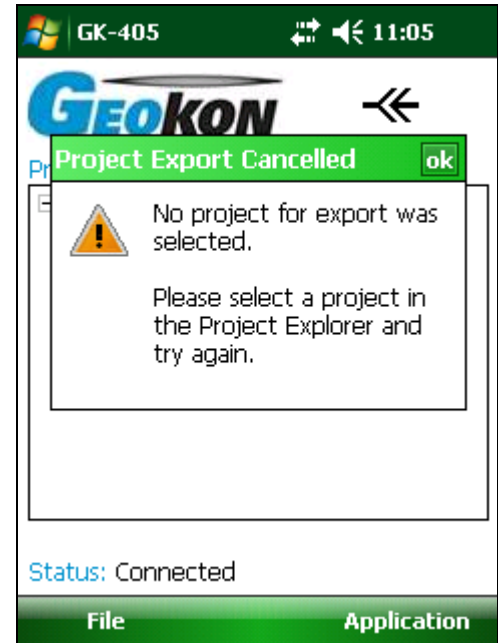


Figure 46 - No Project Selected Error

### 3.5.3 Import Menu

The Import Menu is used to import Project Explorer element settings that were previously exported using the Export Menu functions (see Figure 41).

### 3.5.3.1 Import Project Settings

Clicking on this menu item displays the “Select .LVPE File” window (see Figure 47), from which a project export file can be selected (see section 3.5.2.2). After selection, a new “Project” will be created in the current workspace. This new project will contain all the settings and any sensors (and accompanying data) that were contained in the project export file. If a project with the same name already exists in the current workspace an error message will be displayed and the project import will be cancelled.

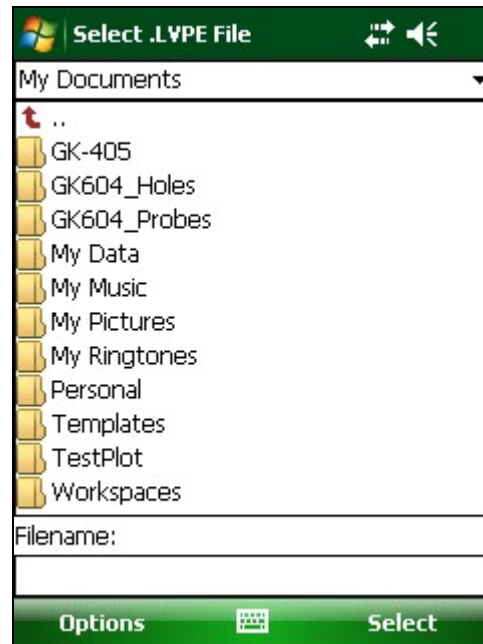


Figure 47 - Select Project Export File

### 3.5.4 View Data

When the View Data Menu is clicked and a sensor has been previously selected, the "Select File" window is displayed (see Figure 48). Tap on a data file to select it for viewing then tap "Select" when done to display the "Sensor Reads" window (see Figure 49).

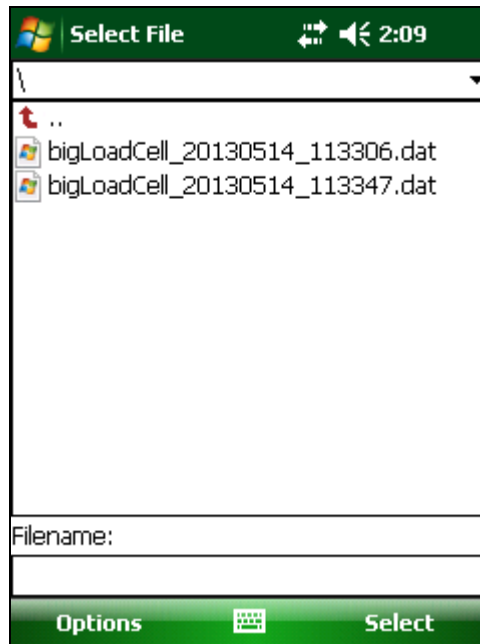


Figure 48 – Data File Selection Window

Year	Day	hours	min	sec	VW Read (kg)	Fe
2013	134	11	26	33	6529.36	6
2013	134	11	26	38	6529.36	6
2013	134	11	27	26	6529.22	6
2013	134	11	27	56	6527.5	6
2013	134	11	28	26	391.354	6
2013	134	11	28	56	26519.84	6
2013	134	11	29	26	2552.9	6
2013	134	11	29	57	2552.91	6
2013	134	11	30	27	6529.01	6
2013	134	11	30	57	6529.15	6
2013	134	11	31	27	6529.15	6
2013	134	11	31	57	6529.07	6
2013	134	11	32	27	6529.1	6

Figure 49 - Sensor Reads Window

The scrollbar at the bottom of the screen can be used to display columns that are off the current "page".

### **3.5.5 Close GK-405**

Tapping on this menu item will cause the program to cease execution. This behavior is exactly the same as tapping on "ok" in the upper-right corner of the display screen.

## 4. Configuring Project Explorer Elements

Each Project Explorer Element has settings that can be configured. For some, like Workspace and Project, the settings consist only of a name and description. Sensor elements require more parameters such as gage factor, initial (zero) reading, and engineering units. These settings can be adjusted to meet the user's needs and the specifications of the sensor. Each element's settings can be adjusted using the Edit Settings option from the Context or Application Menu.

### 4.1 Project Configuration

Figure 50 depicts the Projects Settings window:

- **Project ID**  
Read-only value, generated when the project was created. Used internally by the GK-405 VWRA.
- **Project Name**  
Use the on-screen keyboard to enter a unique and descriptive name for the project.
- **Description**  
Using the on-screen keyboard, enter a brief description pertaining to the project.
- **Created On**  
Read-only date and time value, generated when the project was created.

The screenshot shows the 'Edit Project Settings' window. The title bar is green with the text 'Edit Project Settings' and icons for back, forward, and search. The main content area is white and contains a section titled 'Project Settings'. This section has four fields: 'Project ID' with the value 'proj\_20130703\_13545', 'Project' with the value 'Site 1', 'Description' with the value 'Unstable area called "Site 1"', and 'Date created' with the value '07/03/2013 13:56:19'. At the bottom of the window is a green bar with 'Cancel' and 'Menu' buttons.

Figure 50 - Project Settings

When done editing, project settings can be saved via the "Menu->Save Settings" option. Workspace configuration is similar to project configuration in that only the name and description are editable.

## 4.2 Sensor Configuration

The Sensor settings window manages sensor configuration options through several different screens.

The user can easily navigate between screens by tapping on the Next



or the Previous arrow,



At this time each sensor is always enabled and the selection box located at the top-right hand side of the window will be grayed-out (see Figure 51).

The screenshot shows a mobile application window titled 'Edit Sensors'. At the top, there is a status bar with a Windows logo, the title 'Edit Sensors', and icons for signal strength, volume, and a clock showing 3:01. Below the status bar is a section titled 'General Sensor Information'. This section contains several fields: 'Sensor:' with a dropdown menu set to 'Enabled'; 'Sensor name:' with a text box containing 'sensor1'; 'Description:' with a text box containing 'my new sensor'; 'Sensor ID:' with a text box containing 'G0510110047'; 'Date created:' with a text box containing '05/10/2013 11:01:36'; 'Sensor type:' with a dropdown menu set to 'Vibrating Wire'; and 'Sensor model:' with a dropdown menu set to '45xx'. At the bottom of the form, there are two circular navigation buttons: a left arrow and a right arrow. Below these buttons is a green bar with a small white box containing the number '1'. At the very bottom, there is a green bar with three buttons: 'Cancel', a keyboard icon, and 'Menu'.

Figure 51 - Sensor Settings Window (page 1)

A detailed explanation of the parameters for the General Sensor Information window (see Figure 51) appears below:

- |                    |  |
|--------------------|--|
| <b>Sensor name</b> | This is a user assigned sensor name which is displayed in the project explorer. A descriptive name allows the user to quickly pick the sensor from the list. |
| <b>Description</b> | Verbose description of the sensor which can provide clues to its location, purpose, etc.   |



<b>Sensor ID</b>	This is a system generated sensor ID assigned at the time of sensor configuration creation. This value uniquely identifies the sensor to this application and cannot be changed by the user.
<b>Date created</b>	The system-generated date of the sensor creation is useful for audit purposes. This field cannot be edited and is set to the date when the sensor is enabled.
<b>Type</b>	The sensor type - selected from the list of supported sensor types, i.e., Vibrating Wire (currently the only type supported).
<b>Model</b>	Sensor model - selected from the list of supported sensor models, i.e., 45xx.

The second page of the Sensor Setting window (see Figure 52) contains parameters that determine how sensors are converted from Digits to Engineering Units. A detailed description of all the parameters on this page appears below:

The screenshot shows a mobile application interface titled "Edit Sensors". At the top, there is a status bar with a signal strength icon, a battery icon, and the time "3:03". Below the title bar, the "Conversion Method" section has two radio buttons: "Linear" (which is selected) and "Polynomial". Underneath, the "Linear Coefficients" section contains four input fields: "Output Calculation" is a dropdown menu set to "Digits Only" with a help icon; "Zero Reading" is a text box containing "9872"; "Gage Factor" is a text box containing "-0.00123"; and "Gage Offset" is a text box containing "0". At the bottom of the form are two large green circular arrows pointing left and right. Below these arrows is a green bar with the number "1" on the left. The very bottom of the screen has a green navigation bar with "Cancel", a keyboard icon, and "Menu" buttons.

Figure 52 – Sensor Settings (page 2)

#### Conversion Method:


**Linear** Selecting this radio button enables the Linear Coefficients parameters (see below) and will cause the GK-405 VWRA to apply a linear conversion factor to convert subsequent readings from Digits to Engineering Units.

**Polynomial** Selecting this radio button enables the Polynomial Coefficients parameters (see below) and will cause the GK-405 VWRA to apply polynomial conversion factors to convert subsequent readings from Digits to Engineering Units.

Linear Coefficients:

**Output Calculation** This parameter **must** be set for each sensor before sensor settings can be saved. This parameter ensures that the "gage factor" (below) will be correctly signed if entered directly as printed on the calibration sheet. Valid selections are: "G(R0 - R1)", "G(R1 - R0)" and "Digits Only". When this parameter is set to "Digits Only" no gage factor need be entered below and causes the GK-405 VWRA to display "raw" digits readings.


---

 **Note:** Please consult the calibration sheet for each sensor to determine which formula, **G(R0 - R1)** or **G(R1 - R0)**, to select for the setting above.

---

**Zero Reading** This parameter may be set manually from a previously taken reading.

---

 **Note:** Please consult your sensor manual regarding various techniques for taking a zero reading.

---

**Gage factor** This parameter may be entered directly from the Transducer Calibration Sheet, Linear Gage Factor value.

**Offset** This parameter can be set to any value representing some initial condition. This value will be added to all subsequent readings.

If "Polynomial" is selected in the Conversion Method box (see Figure 52) then the following parameters will be displayed just below it.

Polynomial Coefficients:

**Coefficient A** Enter the Polynomial Gage Factor A from the Sensor Calibration Sheet for this parameter.

**Coefficient B** Enter the Polynomial Gage Factor B from the Sensor Calibration Sheet for this parameter.

**Coefficient C** This parameter should be calculated from a field zero reading. Please refer to your transducer manual for further details on how to calculate Coefficient C.

The third page of the Sensor Setting window (see Figure 53) contains parameters that allow a conversion factor to be applied to data (in Engineering Units), converting it into a user-selected unit of measure. A detailed description of all the parameters on this page appears below:


Figure 53 - Sensor Settings (page 3)

#### Units conversion:

##### **Measurement**

The choices for this parameter are: DEFAULT (digits), PRESSURE, LOAD, and DISTANCE.

---

 **Note:** If the conversion method is set to "Linear" (see Figure 52) AND the "Output Calculation" parameter is set to "Digits Only" then this parameter will have no effect and will be disabled.

---

**Input units**

Native engineering units of the sensor. Choices are dependent on Measurement selection above and can be metric (SI) or English (US customary) units

---

**Warning:** Please consult the calibration sheet that came with your sensor. Selecting Input units that are different from those specified on the calibration sheet may have unexpected consequences.

---

**Output units**

Engineering units of values read and/or logged by the GK-405. The choices for this parameter are dependent on the Measurement and Input units selected above and can be metric or English units.

**Factor**

This parameter is dependent on Measurement, Input units and Output units selections above. This value is calculated by the GK-405 VWRA and is display-only. The Gage factor (see above) is multiplied by this factor before converting sensor reads to engineering units.

The fourth page of the Sensor Setting window (see Figure 54) contains parameters that allow a temperature correction factor to be applied to collected data. A detailed description of all the parameters on this page appears below:

**Edit Sensor Settings**

Temperature Correction

Sensor Correction: Disabled

Initial Temp (°C): 0.00

Thermal Factor: 1

Temperature Display: Celsius

1

Cancel Menu

Figure 54 - Sensor Settings (page 4)

Temperature corrections:

**Sensor Correction**

The choices for this parameter are Enabled or Disabled. Select "Enable" to enable correction of any errors in the sensor reading due to temperature. This feature does not apply to all sensors and will be disabled (grayed) when certain sensor models are selected, i.e., "44xx".

**Initial Temperature**

Initial temperature reading taken when performing a "Zero Reading" of the sensor. This field does not apply to all sensors and will be disabled (grayed) when some sensor models are selected, i.e., "44xx".

**Thermal Factor**

Factor to multiply temperature difference by. Formula is:

*Corrected Reading = Sensor Reading - ((Current Temperature - Initial Temperature) \* Temperature Factor).*

This field does not apply to all sensors and will be disabled (grayed) when certain sensor models are selected, i.e., "44xx".

**Temperature Display**

Selects which units to display the temperature in. The choices are: Celsius or Fahrenheit.

## 5. Files, Folders and Transferring Data

---


The GK-405 VWRA uses several types of files and dedicated folder locations to keep track of Workspaces and Project Explorer element configuration files, such as sensor configuration files and data files. The default locations and names for some of these appear in Table 1:

<b>Purpose</b>	<b>Default Folder</b>	<b>Filename</b>
GK-405 VWRA preferences and configuration	\\Application Data\\Geokon\\GK-405\\	Config.xml
Workspace repository	\\Application Data\\Geokon\\GK-405\\Workspaces\\	N/A
Project repository (Workspace)	\\Application Data\\Geokon\\GK-405\\Workspaces\\<WRK_SPC_FLDR>\\ <sup>(1)</sup>	.wkspc
Sensor repository (Project)	\\Application Data\\Geokon\\GK-405\\Workspaces\\<WRK_SPC_FLDR>\\<PROJECT ID>\\ <sup>(2)</sup>	.proj

Table 1 – Folder paths and File Names

1. <WRK\_SPC\_FLDR> is usually the same as the workspace name but is not required to be.
2. <PROJECT ID> can be found in each Project's settings.

---

 **Note:** Manual editing any of the configuration files and/or renaming folders above is **strongly** discouraged and may cause all configuration data to be lost!

---

### 5.1 File Transfer

In general, the only files generated by the GK-405 IRA that will have to be transferred are the sensor data files, although periodically archiving others on a “master” PC is recommended. Connecting the Field PC to a desktop or laptop PC using the supplied USB cable (Type A to mini B) is straight forward and allows the user to view the Field PC’s storage as a flash drive on the desktop/laptop; you can then simply drag the files around to any folder on the desktop/laptop.

- If you are using Windows XP you will need to download and install the program, “ActiveSync”. This application is available for free from the Microsoft site ([www.microsoft.com](http://www.microsoft.com) and search for “Active Sync download”). Once installed

(generally requires a reboot), simply connect the USB cable from the Field PC and then open "My Computer" on the XP machine and see a "PDA" entry under drives. Just double click on it to see the folders in the Field PC.

- If you are using Windows Vista or Windows 7, Microsoft includes software called Windows Mobile Device Center and you should be able to immediately connect to the Field PC and see it in the "Computer" window.

It is not necessary to set up any 'syncing' options although it can easily be accomplished. Another Bluetooth partnership can also be set up from your desktop/laptop (assuming they have Bluetooth modules) to the Field PC and transfer files that way.

All of these options (and more) are described in the Field PC's Reference Guide.

## 5.2 Backing up configurations

To guard against accidental data loss and as a matter of good computer technique, critical data and configuration files should be periodically backed up.

- Entire projects can be backed up using the Project Export function from the File menu. After exporting, the resulting ".lvpe" file should be transferred to a desktop PC using the techniques described in section 5.1
- Although backing up a project automatically includes any data files stored as part of the project element "sensor" structure, data files can be individually backed up per hole using the Data Export function from the File menu. After exporting, the resulting ".csv" file should be transferred to a desktop PC using the techniques described in section 5.1

## APPENDIX A. GK-405 Connections

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### A.1. Single Sensor Connection

Figure 55 shows a close-up view of the 10-pin Bendix “Sensor” connector. Table 2 lists the pin-out for this connector.



*Figure 55 - Single Sensor Connector*



10-pin Bendix Plug (PT06F-12-10P)	Alligator Clip Boot Color (Flying Leads)	Signal Description
A	Red	Vibrating Wire Gage +
B	Black	Vibrating Wire Gage -
C	White	Thermistor +
D	Green	Thermistor -
E	Blue	Shield
F		
G		
H		
J		
K		

Table 2 - Single Sensor Pin-out

## A.2. Load Cell Connection

Figure 56 shows a close-up view of the 10-pin Bendix “Load Cell” connector. Table 3 lists the pin-out for this connector.

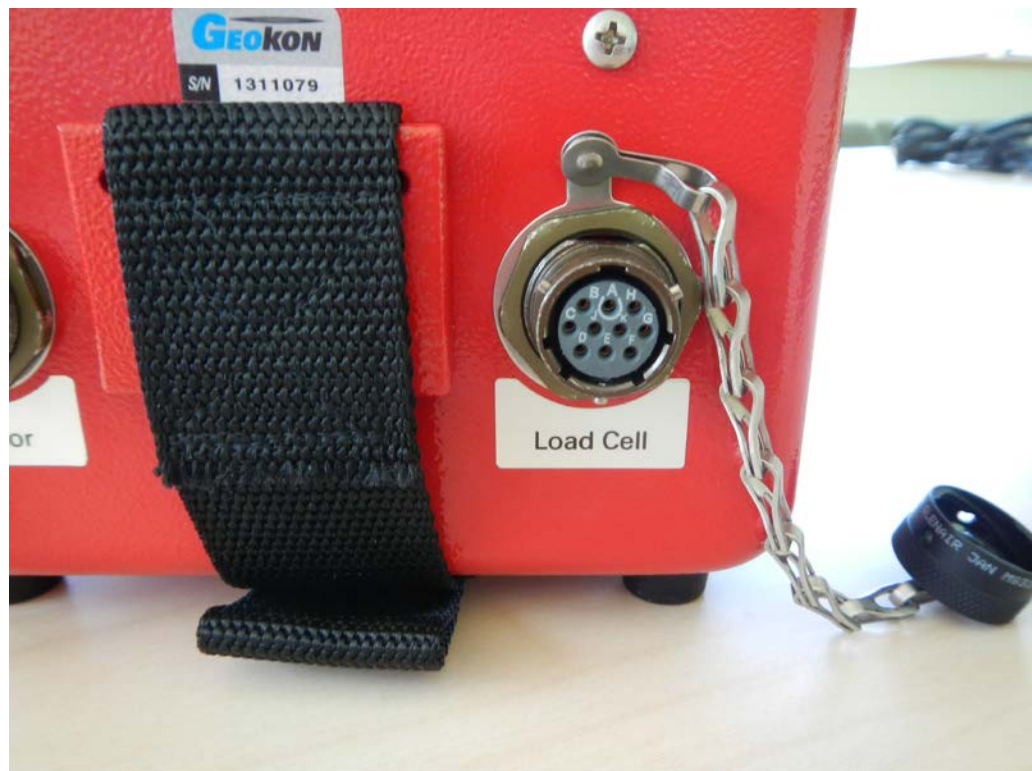


Figure 56 - Load Cell Connector

10-pin Bendix Plug (PT06F-12-10P)	Signal Description
A	Vibrating Wire Gage 1 +
B	Vibrating Wire Gage 2 +
C	Vibrating Wire Gage 3 +
D	Vibrating Wire Gage 4 +
E	Vibrating Wire Gage 5 +
F	Vibrating Wire Gage 6 +
G	Shield Common
H	Vibrating Wire Gage – (Common)
J	Thermistor +
K	Thermistor -

*Table 3 - Load Cell Connector Pin-out*

### A.3. Charger Connections

Figure 56 shows a view of the GK-405 Remote Module Charger connection.



*Figure 57 - Charger Connection*

## APPENDIX B. Remote Module Command Structure

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COMMAND	FUNCTION	SYNTAX	RETURN VALUE
0	N/A		
1	N/A		
2	N/A		
3	N/A		
4	READ FIRMWARE VERSION	4	VER#.#
5	N/A		
6	N/A		
7	N/A		
8	N/A		
9	N/A		
V6	REQUEST 6 READS	V6	##### 0000000 0000000 0000000 0000000 0000000
V6%	SET GAGES SPECTRUM	V6(A – F)	%%%%%%%%
V7	TAKE BATTERY READING	V7	<sp><sp>+#. #
V8	TAKE +5V READING	V8	<sp><sp>+#. #
VT	SENSOR TEMPERATURE (°C)	VT	(+/-)##.####

### Example 1: READ FIRMWARE VERSION

Reads the firmware version of the Remote Module:

Command: 4<CR>

Response: Geokon405 Ver1.0 0320

### Example 2: REQUEST 6 READS:

Get sensor readings for up to 6 Vibrating Wire “cells” (“0000000” returned for unconnected gages):

Command: V6<CR>

Response: 0200000 0000000 0000000 0000000 0000000 0000000

### Notes:

1. The above response shows that there is one gage (of 6) connected
2. Raw gage values are in units of nanoseconds
3. Frequency (F, in Hz) = 1 / T (sec); F = 1 / 0.0002 = 5000 Hz
4. Digits =  $F^2/1000 = (5000)^2/1000 = 25000$

**Example 3: SET GAGES SPECTRUM:**

Set the operating “pluck” spectrum to the “B” range (1400 – 3500 Hz) for each gage:

Command:     V6B<CR>

Response:     BBBBBB

**Example 4: TAKE BATTERY READING:**

Display the current voltage level of the lithium battery:

Command:     V7<CR>

Response:     +7.6

## APPENDIX C. Data File Formats

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### C.1 Raw Data Text Report

When exporting, “raw” text data is the default for the Extended Format options of the “Export Data Menu” (see section 3.5.2.1 and Figure 43).

```
2013,140,10,28,28,.83,21.8,9196.9,0.0,0.0,0.0,0.0,0.0,9196.9,1
2013,140,10,28,38,.4,21.8,9545.7,0.0,0.0,0.0,0.0,0.0,9371.3,2
2013,140,10,28,48,.65,21.8,9345.8,0.0,0.0,0.0,0.0,0.0,9362.8,3
2013,140,10,28,58,.8,21.8,9218.6,0.0,0.0,0.0,0.0,0.0,9326.7,4
2013,140,10,29,8,1.27,21.8,8842.8,0.0,0.0,0.0,0.0,0.0,9230.0,5
2013,140,10,29,18,2.39,21.8,7929.2,0.0,0.0,0.0,0.0,0.0,9013.2,6
2013,140,10,29,28,3.03,21.8,7405.9,0.0,0.0,0.0,0.0,0.0,8783.5,7
2013,140,10,29,38,.01,21.8,9866.1,0.0,0.0,0.0,0.0,0.0,8918.9,8
2013,140,10,29,48,.01,21.9,9863.3,0.0,0.0,0.0,0.0,0.0,9023.8,9
2013,140,10,29,58,2.33,22.9,7977.8,0.0,0.0,0.0,0.0,0.0,8919.2,10
2013,140,10,30,8,1.74,23.5,8458.7,0.0,0.0,0.0,0.0,0.0,8877.3,11
2013,140,10,30,18,.03,23.5,9847.6,0.0,0.0,0.0,0.0,0.0,8958.2,12
```

**Column: 1    2   3   4   5    6   7       8       9   10   11   12   13       14   15**

**Where:**

Column 1 represents the year when the array was stored  
 Column 2 represents the Julian day when the array was stored  
 Column 3 represents the hour when the array was stored  
 Column 4 represents the minute when the array was stored  
 Column 5 represents the second when the array was stored  
 Column 6 represents the vibrating wire reading in engineering unit if applicable  
 Column 7 represents the sensor temperature in degrees C or degrees F  
 Column 8 represents the raw vibrating wire reading in digits (cell 1)  
 Column 9 represents the raw vibrating wire reading in digits (cell 2)  
 Column 10 represents the raw vibrating wire reading in digits (cell 3)  
 Column 11 represents the raw vibrating wire reading in digits (cell 4)  
 Column 12 represents the raw vibrating wire reading in digits (cell 5)  
 Column 13 represents the raw vibrating wire reading in digits (cell 6)  
 Column 14 represents the raw vibrating wire reading in digits (average of 1 – 6 above)  
 Column 15 represents the array number

**Note:** The number (and definition) of columns may change as “Export Data→  
 Extended Format” options are changed (see Figure 43)

## C.2 Data Text Report with Column and Report Headers

The report below (see Figure 57, shown in Excel format for clarity) illustrates additional report formatting capability by adding column and report headers. Note that the sensor name has also been included and the date and time appear as one field by using the Y1900 Date/Time option.

Sensor Data											
-----											
Project Name: Site 1											
Sensor Name: sensor1											
Sensor Model: 45xx (Piezometer)											
File Name: sensor1_20130703_142209.CSV											
-----											
Sensor Name	Date and Time	VW Rdgs (psi)	Temp Rdg (deg. C)	Raw Rdgs 1 (dig.)	Raw Rdgs 2 (dig.)	Raw Rdgs 3 (dig.)	Raw Rdgs 4 (dig.)	Raw Rdgs 5 (dig.)	Raw Rdgs 6 (dig.)	Raw Rdgs Avg (dig.)	Array#
sensor1	7/3/2013 14:21:13	1.06	22.2	8610.6	0	0	0	0	0	8610.6	1
sensor1	7/3/2013 14:21:20	0.99	22.1	8040.9	0	0	0	0	0	8325.7	2
sensor1	7/3/2013 14:21:27	0.96	22	7778.4	0	0	0	0	0	8143.3	3
sensor1	7/3/2013 14:21:30	0.88	21.9	7132.5	0	0	0	0	0	7890.6	4
sensor1	7/3/2013 14:21:34	1.14	21.9	9227	0	0	0	0	0	8157.9	5
sensor1	7/3/2013 14:21:38	1.14	21.9	9214.6	0	0	0	0	0	8334	6
sensor1	7/3/2013 14:21:41	1.14	21.9	9222.5	0	0	0	0	0	8460.9	7
sensor1	7/3/2013 14:21:45	1.08	21.9	8776.1	0	0	0	0	0	8500.3	8
sensor1	7/3/2013 14:21:50	1.21	21.9	9795.2	0	0	0	0	0	8644.2	9
sensor1	7/3/2013 14:21:54	1.2	21.8	9696.8	0	0	0	0	0	8749.5	10
sensor1	7/3/2013 14:21:59	0.6	21.9	4878.6	0	0	0	0	0	8397.6	11
sensor1	7/3/2013 14:22:01	0.84	21.9	6768.6	0	0	0	0	0	8261.8	12
sensor1	7/3/2013 14:22:03	0.88	21.9	7109.2	0	0	0	0	0	8173.2	13

Figure 58 - Enhanced Data Text Report

## APPENDIX D. Specifications

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### D.1 GK-405 (Remote Module) Specifications

<b>Vibrating Wire Readout:</b>	
Excitation Range	450 Hz to 6000 Hz, 5 volt square wave
Measurement Resolution	1ns
Time base Accuracy	± 50ppm
<b>Temperature Readout:</b>	
Sensor Type	Thermistor, Dale #1C3001-B3 (YSI 44005)
Sensor Accuracy	±0.5° Celsius
Measurement Range	-50° to +150° Celsius
Measurement Resolution	0.1° Celsius
Measurement Accuracy	0.5% to 1.0% FSR
<b>Communications:</b>	
Wireless protocol	Bluetooth®, 2.0 +EDR, Class 1, range 20 m
Bluetooth profile	Serial Port Profile (SPP)
Parameters	9600 baud, 8 data bits, 1 stop bit, no parity, full duplex, non-configurable
Transmission Format	ASCII
<b>Physical:</b>	
Dimensions (L×W×H)	210mm × 165mm × 185mm (8.25" × 6.5" × 7.25")
Weight	2.45kg (5.40 lbs.)
Temperature Range	-10° to +50° Celsius
Battery	7.4 volt, 2600 mAHr Li-Ion
Operating Time	approximately 40 hours

## D.2 Hand-Held Device (HHD-NX7-B) Specifications

Processor	806 MHz PXA310
Operating System	Windows Mobile® 6.1 Classic
Included Software	Microsoft® Office Mobile; multiple languages
Memory	128 MB RAM
Data Storage	4 GB internal data storage; compact Flash slot (Type I or II); SD/SDHC slot; SDIO supported; user accessible CF and SD slots
Color Display	480x640 pixel, Anti-glare 3.5" VGA resolution, sunlight readable, 262K color (18 bit), TMR Technology with LED backlight.
Keyboard	Dedicated backlit numeric keypad; Four-way directional buttons using function key (Fn); discrete keys for Start, Menu Left, Menu Right, Camera, "ok", Return and Power/Suspend;
Ports	RS-232C 9-pin "D" connector; 1 x USB host and client (Mini AB USB OTG, 1.2 host, 2.0 client); 12 VDC @ 4.1 Amps Max power in;
Case	IP67 waterproof
Environmental	Tested to MIL-STD810F for water, humidity, sand, dust vibration, altitude, shock and temperature
Power	Intelligent 5600 mAh Li-Ion battery; can be easily changed in the field without tools
Wireless Connectivity	Internal Bluetooth® wireless technology option, 2.0 +EDR, Class 1, range 20 m; WLAN: Integrated 802.11b/g supports AES TKIP, WEP, WPA and WPA2
Certification & Standards	FCC Class B; CE Mark; EN60950; RoHS compliant; FM approved Class I, Div 2
Operating Temperature	-30°C to 60°C
Storage Temperature	-40°C to 70°C
Shock Survival	Multiple drops from 1.22 m onto concrete
Dimensions (L x W x H)	179 mm (7") x 97 mm (3.8") x 37 mm (1.5")
Weight	490 g, with battery